

Proposal #: 20AKR015-007

Project Title: Hatchery Capacity & Technology Development to Secure Seed Supply for Oyster Farming in Alaska

Applicant: Alaska Fisheries Development Foundation (AFDF)

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Julie Decker Executive Director, AFDF (jdecker@afdf.org)

Abstract: Alaska has all the qualities of an ideal environment for mariculture development, including 30,000 miles of remote coast, working waterfronts with maritime skills, a connection to the sea and an existing seafood industry which is larger than the rest of the U.S. combined. Although the mariculture industry in Alaska is in its infancy, it is poised to experience considerable growth in the near future. Shellfish and seaweed hatcheries are an integral piece of infrastructure required for any mariculture development and securing seed supply through hatcheries is the #1 priority recommendation of the Alaska Mariculture Development Plan. OceansAlaska is a marine science center and shellfish hatchery, located in Ketchikan, Alaska. Its mission is to support the mariculture industry by developing the capacity to produce commercial quantities of Pacific oyster seed for shellfish farmers in Alaska and the lower 48. To accomplish this goal, AFDF, Premium Aquatics, Oregon State University (OSU) researchers will work directly with OceansAlaska and project partners on training, transfer of best practices and technology development to secure seed supply for Pacific oyster (*Crassostrea gigas*) farms in Alaska. Additionally, this project will examine the performance of selected and triploid lines of Pacific oysters in different environments.

Potential Commercial Benefits to the Fishing Community of the Research Results: Fishermen, businesses and communities dependent on fisheries face significant challenges when limited access is placed on fishery resources, fishing is reduced due to depressed stocks, or climate change negatively impacts fish stocks (i.e. Pacific cod declines in Gulf of Alaska which seem to have moved to cooler waters in the Northern Bering Sea). In order to promote sustainable uses of fishery resources, fishing-dependent businesses and communities need supplemental sources of economic activity. The development of Alaska's oyster industry will provide economic resiliency and diversification for fishermen and processors which aligns well with their skills, seasonal timing and existing capital assets.

Proposal #: 20GAR001-055

Project Title: Sustainable innovations for the channeled whelk fishery: trap modifications and alternative bait

Applicant: University of New Hampshire

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Dr. Elizabeth A. Fairchild, elizabeth.fairchild@unh.edu

Abstract: Channeled whelks (*Busycotypus canaliculatus*) are predatory marine gastropods that support lucrative commercial fisheries along the east coast of the United States; the highest landings occur in the waters around Massachusetts. Similar to the lobster fishery, channeled whelks are caught in baited traps, yet there is no industry trap standard nor requirement of escape vents. In addition, all whelk fishermen rely on horseshoe crabs (*Limulus polyphemus*), an exploited species in jeopardy, as one of several ingredients in their custom bait blends. Some attempts have been made to develop alternative baits to reduce the amount of *Limulus* needed to fish for whelk, but according to the industry, these products are inferior to using *Limulus*. We propose to work with the whelk industry to develop more sustainable and environmentally-friendly products: (1) channeled whelk traps designed to allow the escape of sublegal whelks, and; (2) an effective channeled whelk bait that utilizes less *Limulus* and more low-cost, low-impact ingredients such as invasive green crabs, surf clam processing waste, and *Limulus* hemolymph waste (leftover after processing for *Limulus* Amebocyte Lysate). Both modified traps and alternative baits will be developed in conjunction with industry input and participation throughout the entire process.

Summary of potential commercial benefits to the fishing community of the research results: The end products of this research are a trap design and bait recipe, applicable for the entire regional channeled whelk fishery, and beneficial to both the fishing industry and the fisheries resource. Incorporating escape vents into whelk traps will reduce sublegal whelk catch, possibly other bycatch, increase efficiency at sea by reducing trap sorting time, and negate the damaging fishing impacts of ghost traps. Formulating a cost-effective, alternative whelk bait will be more sustainable by utilizing existing waste streams from other industries and reducing (possibly eliminating) *Limulus* used in whelk bait, thus placing less pressure on overexploited horseshoe crabs.

Proposal #: 20GAR003-110

Project Title: Sustainable US cleanerfish production: developing a lumpfish broodstock program

Applicant: University of New Hampshire

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigators: Dr. Heather Hamlin, heather.hamlin@maine.edu: Dr. Michael Chambers, Michael.Chambers@unh.edu: Dr. Todd Guerdat, Todd.guerdat@unh.edu

Abstract: Lumpfish, a species native to the Gulf of Maine, are proven successful cleanerfish that can delouse salmonids when integrated into salmonid farms. This biological control strategy is used throughout all north Atlantic salmonid-rearing countries except in the US. Domestic Atlantic salmon and steelhead trout farmers want the ability to use cleanerfish in their farms, however, there is neither a US lumpfish source nor an established permitting process for using cleanerfish in Maine and NH farms. Developing methods to rear fish in captivity with locally sourced fish and maintain self-supporting populations, is key to the commercial viability of any aquaculture operation, especially when fish will be stocked into sea cages. At UNH and UME, with lumpfish research already underway and an existing captive population, we are able to address this bottleneck. We propose to conduct lumpfish broodstock maturation studies, thus providing a source of lumpfish eggs for other US researchers and bringing attention to and spurring other lumpfish research activities. We recognize the need to more widely disseminate cleanerfish strategies, so a series of stakeholder workshops will be held. Our goal is that the outcome of this research will ultimately lead to the integration of cleanerfish into US salmonid farms.

Summary of potential commercial benefit to the fishing & aquaculture communities: The end products of this research are the development of a lumpfish broodstock program which will create a source of fertilized lumpfish eggs available to any researcher or emergent lumpfish hatchery. The formation of this multi-entity group that supplies wild lumpfish to the broodstock program and knowledge, resulting from the workshops, about using cleanerfish in salmonid farming operations, will galvanize lumpfish use in US salmonid farms. This could lead to new business opportunities (lumpfish hatcheries and grow out facilities, support, infrastructure, and equipment for cleanerfish in salmonid farms) and increase domestic production of Atlantic salmon and steelhead trout. The fishing community would have a new, high-value, opportunity to supply live, adult, wild lumpfish to broodstock facilities.

Proposal #: 20GAR017-007

Project Title: Enhancing sustainable development of the winter bait fishery for Atlantic Menhaden through the use of industry acoustics

Applicant: University of Maryland Center for Environmental Science

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Geneviève Nessler, Ph.D., nessler@umces.edu

Abstract: Winter bait fishing opportunities for Atlantic Menhaden (*Brevoortia tyrannus*) are currently limited by quota allocations established using landings from 2009-2011 prior to the winter fishery's development in 2014. To determine if higher harvest levels are sustainable, an estimate of the size and age structure of the overwintering stock is needed. We propose to conduct a cooperative acoustic study of the overwintering resident stock of Atlantic Menhaden Proposal 20GAR007 Page 2 located offshore of the New Jersey coast to generate estimates of local stock biomass and structure. Project results would allow scientists to evaluate effects of an expanded fishery and give managers a better sense of the fishery's expansion potential. This project directly addresses S-K Priority #2 by providing the science and technology necessary to support sustainable development of the winter bait fishery for Atlantic Menhaden and maximize fishing opportunities for the Mid-Atlantic midwater trawl fleet. By employing advanced echosounder and sonar equipment used on active fishing vessels, we will evaluate industry-series acoustic technology for use in cooperative research. In addition, field confirmation of overwintering adult menhaden will reduce assessment uncertainty by characterizing spawner biomass not typically encountered in fishery sampling or inshore fishery-independent surveys.

Summary of potential commercial benefits to the fishing community of the research results: Our team of fishing industry members and federal, state, private, and academic scientists will work cooperatively to gather the scientific data needed by fishery managers to sustainably develop the offshore winter bait fishery for Atlantic Menhaden. This collaborative research will promote scientifically informed fisheries management of Atlantic Menhaden that can help maximize fishing opportunities for the Mid-Atlantic midwater trawl fleet. Both fishers and bait processors play critical roles in this cooperative research through the use of industry vessels and acoustic equipment, fisher knowledge, and through dockside weighing of schools encountered.

Proposal #: 20GAR028-065

Project Title: CFRF's Lobster and Jonah Crab Research Fleet: A Collaborative Fishing Vessel Approach to Addressing Data Needs for the American Lobster and Jonah Crab Fisheries

Applicant: Commercial Fisheries Research Foundation

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Christopher Glass, cglass@cfrfoundation.org

Abstract: The proposed project focuses on continuing CFRF's successful Lobster and Jonah Crab Research Fleet (currently funded by 2017 S-K Program Award # NA17NMF4270208), which implements a cost-effective method to collecting biological data, especially from under-sampled offshore areas, in support of stock assessments and management plans for the American lobster and Jonah crab fisheries. To date, the 21 fishing vessels participating in the Lobster and Jonah Crab Research Fleet have collected biological data from over 139,973 lobsters and 74,540 Jonah crabs as well as coupled bottom water temperatures from the Gulf of Maine to the Mid-Atlantic. These data have been used extensively by stock assessment scientists and managers. The proposed project seeks to extend this successful data collection effort for an additional 12 months, and to add two new vessels, while also testing Bluetooth calipers for data collection. Ultimately, continuation of the Lobster and Jonah Crab Research Fleet will provide data from areas and times of year not covered by existing surveys, which is critically important for the assessment and management of these valuable resources.

Summary of potential commercial benefits to the fishing community of the research results: The anticipated benefits and outcomes of the proposed project are as follows: 1) Demonstration of a cost-effective and efficient way for members of the commercial fishing industry to help supply needed biological data for lobster and Jonah crab stock assessments and management plans, 2) Implementation of new technology (Bluetooth calipers) to increase the efficiency of at-sea lobster and Jonah crab sampling, 3) Provision of biological and catch data for lobsters and Jonah crabs from otherwise un-sampled areas and time of year, 4) Development of a seven year time series of biological lobster and Jonah crab data and bottom water temperature to advance understanding of the impacts of a changing environment on these valuable fisheries resources, 5) Increased transparency of the lobster stock assessment process and trust in the data sources used.

Proposal #: 20GAR032-067

Project Title: Improving Business Practices to Reduce Mortality in the Lobster Supply Chain

Applicant: University of Maine

Priority Addressed Priority #1 – Promotion, Development and Marketing

Principal Investigator: Richard A. Wahle, richard.wahle@maine.edu

Abstract: This project primarily addresses SK Priority #1 – Promotion, Development, and Marketing Projects, and secondarily Priority #2 – Science and technology promoting sustainable seafood production. To address these priorities, we propose to monitor and mitigate stress points in the supply chain of American lobster with the overall goal of avoiding waste and improving efficiency and profitability. The project builds upon preliminary work already begun through a collaboration between the Maine Lobster Dealers’ Association and UMaine’s Lobster Institute, its affiliated faculty within UMaine, and external scientific collaborators at St. Josephs College and Wells National Estuarine Research Reserve. We specifically propose to promote better handling practices to reduce the mortality or “shrink” in the harvester-to-dealer segment of the lobster supply chain where the industry can most influence down-stream quality. Under our monitoring objective we aim to identify specific stress points in the supply chain by relating quantitative information on environmental conditions to lobster health indicators. Under our mitigation objective we aim to evaluate recommended mitigation strategies emerging from our monitoring objective. We also plan to implement outreach and education that will convey our findings and mitigation recommendations to the wider industry. The project also creates training opportunities at the graduate and undergraduate level.

Summary of potential commercial benefits to the fishing community of the research results:

Identifying and mitigating stress points along the supply chain can mean millions of dollars of savings and avoided waste for the US lobster industry. Lobster dealers, processors and pound owner typically experience shrink rates ranging from 3-20%. For an annual harvest valued near half a billion dollars, this level of loss could equate to as much as one hundred million dollars. By identifying the stress points and recommending ways to mitigate them, the proposed project aims to help the industry stem these losses, improve profitability, and make more efficient use of our valuable, publicly managed resource.

Proposal #: 20GAR033-024

Project Title: Expanding a New England green crab pilot fishery by providing a molt detection assay and identifying seasonal aggregations for harvest

Applicant: Wells Nat'l Estuarine Research Reserve Management Authority

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Jason Goldstein, Ph.D., jgoldstein@wellsnerr.org

Abstract: Fishers and shellfish harvesters have significant concerns over the negative impacts the invasive green crab (*Carcinus maenas*) is having on their fisheries and ecosystems due to predation on economically important species and reduction of biodiversity. The impacts from green crabs have re-invigorated mitigation efforts through crab removal programs and pilot fisheries in some areas. In New England, a green crab fishery would meet several economic and ecological needs including: 1) high value seafood product(s), 2) an alternative income source for fishers, 3) reduction of green crab populations, and 4) more stabilized coastal and estuarine ecosystems. The success of such an initiative depends on fisher participation, interest, and evidence of financial benefit. Two challenges in expanding these activities are identifying pre-molt crabs (for soft-shell crab production) and a lack of knowledge on spatio-temporal aggregations of pre-molt crabs to maximize fishing efficiency. To fill these knowledge gaps, we propose to develop a molt stage assay and characterize green crab distribution and movements in a New England estuary. We will use complementary approaches, including determination of molt stage and timing, traditional trapping, and acoustic telemetry to evaluate their use of estuaries and coastal systems within the context of their molting cycle.

Summary of potential commercial benefits to the fishing community of the research results: This project will leverage the potential to access an underutilized species and allow coastal managers to prioritize mitigation and restoration efforts based on the spatial and temporal use of habitats by green crabs. This project will expand the current knowledge base that is integral to developing a financially viable future green crab fishery in southern Maine and Seacoast New Hampshire. Harvesters would gain the capacity to optimally target pre-molt crabs in space and time. Collectively, this project will provide a seafood product, help inform management, and aid the mitigation of this invasive species that threatens vulnerable estuarine ecosystems.

Proposal #: 20GAR043-113

Project Title: Adapting High Pressure Processing (HPP) Technology to Enhance the Competitiveness of the Domestic Blue Crab Industry

Applicant: University of Maryland

Priority Addressed Priority #1 – Promotion, Development and Marketing

Principal Investigator: Dr. Catherine Liu, cathyliu@umd.edu

Abstract: The US blue crab industry is facing tremendous challenges including strong competition from imported products with a longer shelf life. In particular, competition from Venezuelan fresh pre-cooked crabmeat has caused US blue crab processors to lose an enormous amount of market share. After a 2018 multi-state outbreak of *Vibrio parahaemolyticus* infection was linked to their product, Venezuela adopted high pressure processing (HPP) technology for use on their crabmeat. The HPP technology provides improved food safety and extended shelf life, contributing to an immediate competitive advantage for the Venezuelans. In order to help protect our domestic industry from predatory competition from foreign processors, especially those located in Venezuela, we have developed this proposal to address an urgent need within the domestic blue crab industry. The overall goal of this project is to validate the HPP technology for enhancing the microbiological quality and shelf life of domestic blue crab meat, and to establish and communicate marketing strategies that the industry can execute. We anticipate that this important research will bring validated HPP technology to the US blue crab processors, thus enhancing the competitiveness of the US blue crab industry.

Summary of potential commercial benefits to the fishing community of the research results:

- Validate HPP technology to increase the microbiological quality and shelf life of domestic blue crab meat so that the US blue crab industry can better compete with imported HPP-treated crabmeat.
 - Understand economic feasibility and profitability of HPP to domestic crabmeat processors.
 - Establish and communicate marketing strategies the industry can execute to promote HPP-treated crabmeat to wholesale and retail buyers and the general public.
 - Promote better business practices to increase market demand for US blue crab meat.
 - Improve regional and national marketing opportunities that can increase the competitiveness of US blue crab industry against imported products.
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Proposal #: 20GAR049-033

Project Title: Fishadelphia: Expanding a successful program connecting NJ seafood harvesters with culturally and economically diverse seafood consumers

Applicant: Fishadelphia Community Seafood Program

Priority Addressed Priority #1 – Promotion, Development and Marketing

Principal Investigator: Dr. Talia Young, Director, fishadelphia.csf@gmail.com

Abstract: Building domestic markets for locally caught seafood is a critical strategy for supporting resilience of US small-scale fishing communities. Consumers of color and low-income consumers represent a largely untapped and high potential market for local seafood marketing. This project will build on the success of Fishadelphia, a local initiative working to connect NJ seafood harvesters with culturally and economically diverse consumers, expanding the program's reach to a new group of retail customers as well as a diverse group of restaurants. This project will develop two major programmatic components: a new school-based retail location, and a restaurant program, as well as multiple community events for stakeholders across the seafood supply chain. These components will enable direct sales of locally harvested seafood to a diverse group of new retail consumers and restaurants as well as engage a new group of high school students in issues facing fishing communities. This project will further assess the impact of this project on awareness of coastal and marine issues, evaluate the implementation process, and develop educational tools for replication elsewhere. This project is the first of its kind engaging communities of color and low-income communities about issues facing fishing communities, while focusing on fish people eat.

Summary of potential commercial benefits to the fishing community of the research results:

This project will develop and evaluate market relationships between NJ seafood suppliers and culturally diverse consumers, thereby developing and assessing a market intervention model to support fishing community resilience. This project will result in direct sale of 7000+ lbs of locally harvested fish to hundreds of new consumers, including at least five species considered bycatch and/or underutilized, accruing at least \$70K in direct revenue to those local harvesters. Even more than the species sold and money earned during these two years, this project will build market systems that will allow increasing and continuing sales and education long after this funding stream concludes.

Proposal #: 20PIR003-017

Project Title: Advancing the Promotion, Development and Marketing for Hawaii's Local Sustainable Fisheries

Applicant: Conservation International Foundation

Priority Addressed Priority #1 – Promotion, Development and Marketing

Principal Investigator: Matthew Ramsey, mramsey@conservation.org

Abstract: The goal of this project is to strengthen the viability of Hawaii's local seafood industry by creating a scalable market-based model that promotes better business practices and marketing strategies to increase production and market demand for local and sustainable fish species. This project will create an innovative "Pacific Chef Network," establishing a long-term, self-sustaining mechanism to increase market demand for sustainable seafood, create value-added seafood products, and increase business opportunities for Hawaii's seafood industry and commercial and recreational fishers. The Pacific Chef Network will prioritize business practices for improvement and will launch a pilot initiative targeted at increasing the market demand for the underutilized, the bluestripe snapper. This pilot initiative will illustrate and promote the value and importance of improving sustainable business practices. 2 The Pacific Chef Network's pilot will also refine marketing and promotion strategies in preparation for a high visibility, high impact, month long campaign in October 2021. In collaboration with NOAA's National Seafood Month, the Hawai'i Seafood Month campaign will be launched with a number of local, regional, and global educational and culinary events to promote better business practices to increase production and market demand for U.S. commercial and recreational fish species.

Summary of potential commercial benefits to the fishing community of the research results:

This project will create a scalable market-based mechanism that promotes better business practices leading to increased demand for U.S. commercial and recreational fish species in Hawai'i. By increasing demand for local, sustainable seafood and connecting chefs and restaurants more closely with fishers, this project creates opportunities for innovation, increased production, and increased commercial benefit to the fishing community presently not existing in Hawai'i. Additionally, the heavily promoted Hawai'i Seafood Month campaign and increased local, regional, and global public relations will create enabling conditions for business opportunities to emerge as a result of this market-based model.

Proposal #: 20PIR006-011

Project Title: Building Resiliency in Hawaiian Fishing Communities: A Pilot Project Assessing the Feasibility of Developing a Local Fishmeal Plant

Applicant: Hawaii Feed & Fertilizer LLC

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Crystal Johnson, crystal@hatch.blue

Abstract: Building Resiliency in Hawaiian Fishing Communities: A Pilot Project Assessing the Feasibility of Developing a Local Fishmeal Plant will progress over 18 months and consist of creating and testing fishmeal made from Hawaiian fish processing waste (FPW) which will be utilized to produce locally sourced aquafeed. Proposed activities will take place on Hawaii, Oahu, and in Hafnarfjordur, Iceland. Hawaii Feed & Fertilizer LLC is requesting \$220,000 to perform the proposed activities over this period. The proposed project addresses Priority #2 of the 2020 Saltonstall-Kennedy Competition’s Funding Opportunity; Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting.

Summary of potential commercial benefits to the fishing community of the research results:

One of the greatest barriers to the growth of aquaculture in Hawaii is the high cost of imported aquafeed. Producing an aquafeed locally in Hawaii from locally sourced ingredients, including Hawaiian fishmeal, will remove the chief barrier to aquaculture’s growth and sustainability throughout Hawaii. In addition, surplus fishmeal and oil will be sold to commodity buyers for other local products such as pet feed, fish bait, and fertilizer.

Proposal #: 20PIR016-006

Project Title: Identifying community ideas and prospects to diversify and promote fresh 'ahi, yellowfin tuna, landed by the Kaua'i small boat fishery

Applicant: Pacific Islands Fisheries Group

Priority Addressed Priority #1 – Promotion, Development and Marketing

Principal Investigator: Molly Lutcavage, Ph.D., me.lutcavage@gmail.com

Abstract: Yellowfin tuna, 'ahi, is a key species in the Hawaiian diet, the local economy, and visitor culinary experience. 'Ahi (*Thunnus albacares*) is being fished sustainably, and the high local availability of juvenile and adult fish supports hand line fisheries in the MHI. Each island's 'ahi fisheries are unique and has different features. Kaua'i is dominated by part-time anglers, most of them trollers, whose catch generally supplies the local Kaua'i market. While working together with Kaua'i fishermen on co-operative 'ahi and bottom fish tagging and surveys over the years, and being part of this community, we learned about the unique aspects of the local fishery. This included both advantages and problems Kaua'i fishermen experience in their efforts to provide fresh seafood for residents and visitors. The objective of this proposed work is to identify and evaluate a range of possible approaches to diversify or increase market share and business opportunities for the Kaua'i small boat 'ahi (and other species) fleet, and the community's goals and preferences related to diversification.

We will achieve this by 1. Researching and compiling approaches taken elsewhere to diversify and add value to fresh caught tuna, including consultation with experts and the Kauai Dept. of Economic Development. 2. Determine the small boat fleet's views of past and present performance of the island fishery, their preferences, and interest in diversification or new distribution channels and outlets, through a series of iterative workshops across the island. For peer to peer exchange, we will bring in visiting fishermen experts who have completed successful diversification and expanded markets for tuna/seafood products elsewhere. 3. Near the completion of the work, we will produce a comprehensive summary of findings, formatted as a Curriculum Workbook and illustrated guide, along with an explanatory online presentation.

Summary of potential commercial benefits to the fishing community of the research results:

These products will provide a roadmap to identifying next steps that individuals or local stakeholders might take to implement diversification and increased market shares, as well as to provide more opportunities for island residents and visitors to obtain fresh and affordable local 'ahi.

Proposal #: 20PIR019-014

Project Title: Determining Patterns and Drivers of Life-History Variation to Inform Present and Future Fishery Management in the U.S. Pacific

Applicant: University of Guam

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Brett Taylor, PhD, brettmtaylor@gmail.com

Abstract: Coral reef-associated fisheries in the U.S. Pacific Islands are economically and culturally important, in addition to providing nutritional benefits to communities. As human pressure on coastal fisheries has increased over previous decades, sound management actions have been impeded by a severe lack of biological information for harvested tropical species. Moreover, increasing temperatures associated with climate change are expected to influence biological traits of species, although the magnitude of this influence is poorly understood. Environmentally driven changes in the biology of harvested species has emerged as a major concern for fisheries sustainability and has been consistently recognized as a priority area for U.S.-affiliated Pacific Islands. This project will deliver an integrated series of studies and outreach opportunities rooted in fundamental life-history research to (1) determine robust measures of life-history traits for commercially important species in populated and unpopulated U.S. Pacific Islands, (2) to generalize relationships between environmental factors and fish biological traits to better inform management, and (3) to project and forecast fishery yield across space and time under projected future climate variability. To achieve this, we will use and build upon three existing data sets at different spatial and temporal scales spanning U.S.-affiliated and other islands of the tropical Pacific.

Summary of potential commercial benefits to the fishing community of the research results: Life-history traits of commercially-harvested species serve as foundations to predict and interpret population dynamics, and ultimately guide management and policy through stock assessments. This project will derive biological characteristics of harvested stocks in the inhabited Mariana Islands, thereby enhancing the likelihood for sustainable management. This project will further develop an intuitive biological framework to provide the most informative and robust baseline for evaluating and predicting present and future stock status in coral reef fisheries based on species' biology. It will build capacity for fisheries research within U.S. Territories through collaboration, student mentorship, and formal training workshops.

Proposal #: 20SER001-017

Project Title: An Economic Profiling of North Carolina Shellfish Growers and Their Business Challenges, and an Exploration of Innovative Regulatory Strategies to Promote Growth

Applicant: NC Department of Environmental Quality

Priority Addressed Priority #1 – Promotion, Development and Marketing

Principal Investigators: David Dietz, David.Dietz@ncdenr.gov; Stephanie McNerny, Stephanie.McNerny@ncdenr.gov

Abstract: North Carolina is fostering a burgeoning shellfish mariculture industry, driven primarily by the production of oysters. In response to the organic interest in these products, state lawmakers have expressed clear interest in boosting shellfish mariculture in the state, and becoming a premier destination for farmed shellfish products within the country. Key examples of this are a goal to reach \$33 million in shellfish mariculture production annually by 2030, as well as a new statute that promotes the creation of shellfish enterprise areas (SEAs), a tool already employed in other states, to boost production. Given this landscape, there is a clear need for research to ensure the success of North Carolina's shellfish mariculture future.

This project aims to use primary research to better understand the socioeconomic conditions of North Carolina's shellfish mariculture participants through survey research. Additionally, the project will also leverage key stakeholders from states with mariculture industries and innovative regulations via a working group format to discuss shellfish mariculture, how to foster it, and how to best design SEA regulations. In all, this project maximizes our understanding of the business behind shellfish mariculture in North Carolina, in order to maximize our ability to meet the state's long term vision.

Summary of potential commercial benefits to the fishing community of the research results:

This study allows for benefits to be felt by both private and public stakeholders in the shellfish mariculture industry. By conducting the first socioeconomic profiling of shellfish mariculture operators, we will begin to understand the largest financial, operational, and regulatory barriers to success in North Carolina. This will be complimented by targeted conversations with industry stakeholders to understand the challenges of mariculture regulation and how to successfully innovate. We hope our research leads to higher efficiency and increased profits, while state regulators will benefit from reduced implementation costs and more impactful mariculture, both inside and out of potential enterprise areas.

Proposal #: 20SER006-010

Project Title: Epidemiology and Reproductive Impacts of the newly discovered Egg Parasite *Carcinonemertes obrieni* on the Caribbean Spiny Lobster Fishery in Florida and the Caribbean.

Applicant: Department of Biological Sciences, Clemson University

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Dr. J. Antonio Baeza, jbaezam@clemson.edu

Abstract: The Caribbean spiny lobster *Panulirus argus* is the target of the most socio-economically important fishery in Florida and the Caribbean. Most populations, including Florida, are fully- or over-exploited. We have recently discovered a new species of predatory worm of the genus *Carcinonemertes* from egg masses of *P. argus* in Florida. *Carcinonemertes* worms, including the newly described *C. obrieni*, are voracious egg-predators previously tied to the collapse of other fisheries (e.g., red king crab fishery in Alaska in the 1980's). *Carcinonemertes obrieni* prevalence has risen from 7.4% in summer 2015 to 100% in summer 2017. Furthermore, *C. obrieni* impacts reproductive performance (fecundity plummeted ~40%) of ovigerous female lobsters. This proposal offers a unique opportunity to examine the epidemiology and reproductive impacts of this emergent parasite *C. obrieni* on the lobster fishery in Florida, Mexico, and Belize. Specifically, we will determine the prevalence of *Carcinonemertes obrieni* among *Panulirus argus* populations in Florida as well as in Mexico and Belize, which supply larvae to Florida. We will also determine the impact of *C. obrieni* on *P. argus* reproduction and the potential for infection in the co-occurring Florida stone crab *Menippe mercenaria* and spotted spiny lobster *Panulirus guttatus*

Summary of potential commercial benefits to the fishing community of the research results: Lobster populations throughout the Caribbean, and especially Florida, are highly dependent on exchange of their long-lived pelagic larvae. If this new pathogen also emerges among females from Florida's larval source populations, which includes Mexico and Belize, it may jeopardize the already depressed Florida fishery. Therefore, this proposal will generate information that will aid in the adaptive management of the fishery in light of combined habitat and pathogen impacts. We will be cooperating directly with commercial lobster fishermen during this project (letter of cooperation attached) and will have a direct line to the fishery management agency as results become available.

Proposal #: 20SER010-013

Project Title: Increasing Resilience for Fishing Communities of the Southeast U.S.: Development of Yellowtail Snapper (*Ocyurus chrysurus*) Pilot-scale Growout Technology

Applicant: University of Miami

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: John D. Stieglitz, Ph.D, jstieglitz@rsmas.miami.edu

Abstract: The proposed project aims to future-proof the valuable yellowtail snapper (*Ocyurus chrysurus*) fishery of the U.S., providing increased business opportunities, added value, long-term sustainability, and decreased risk for fishing communities that depend on this fishery. The project directly addresses both of the NOAA Saltonstall-Kennedy 2020 solicitation priorities: “(1) Promotion, Development, and Marketing; and (2) Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting”, with the primary topic being the latter. Direct fisheries impacts will come through the development of a science and technology based pilot project that will lead to the strengthening of existing U.S. fishing communities, and optimization of economic benefits for a fishery through improved practices and sustainable market expansion. The yellowtail snapper fishery represents one of the most valuable hook-and-line fisheries in the Southeast U.S., yet it faces increased threats due to competition with foreign imports, annual catch limit (ACL) allocation issues with the recreational sector, loss of working waterfronts to help sustain the fishery, and vulnerability of the fishery to natural and anthropogenic stressors. The proposed project addresses all of these threats and will provide direct benefits to the fishing communities of the region while connecting all segments of the seafood supply chain.

Summary of Commercial Benefits to the Fishing Community of the Research Results: Benefits to the fishing community will come directly from increased business opportunities, added resilience to working waterfronts, decreased risk from fisheries closures, long-term sustainability, added value to harvested product, improved understanding of the impacts of natural and anthropogenic stressors on the fishery, and hands-on training opportunities in value-added harvest techniques and fish production. The project offers an opportunity to future-proof the U.S. yellowtail snapper fishery, in terms of market expansion, higher ex-vessel pricing, and implementation of techniques and technology to return a greater share of the seafood supply chain profits for this species back to the fishing community.

Proposal #: 20SER016-002

Project Title: Creating resilient oysters (*Crassostrea virginica*) to enhance aquaculture and restoration

Applicant: Marine Environmental Sciences Consortium

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigators: Dr. Lee Smee, lsme@disl.org; Dr. Ben Belgrad, bbegrad@disl.org; Dr. William 'Bill' Walton, bwalton@disl.org

Abstract: Oyster (*Crassostrea virginica*) harvesting is a key feature of the economy and culture of Gulf Coast states. Unfortunately oyster populations have declined precipitously, and harvesting is 1/8 of historic levels in Mississippi and remains closed in Alabama due to low natural abundance. To restore oyster populations and boost production levels, state fisheries resource agencies in Mississippi and Alabama initiated a fisheries enhancement effort to rebuild oyster populations and increase on-bottom aquaculture by remote setting where hatchery reared oyster larvae are settled onto hard substrate (e.g. shell) and then placed in an estuary to form a new reef or enhance an existing reef base. We will investigate a new hatchery technique to increase oyster resilience, aquaculture yields, and improve remote setting restoration by stimulating oysters to grow thicker shells, thereby reducing their predation risk and susceptibility to stressful abiotic conditions. Our previous research revealed early exposure to predator cues caused oysters to produce thicker, stronger shells, which increased their survival. We hypothesize that exposure to predator cues within the hatchery will speed oyster growth, cause them to grow stronger shells that have higher survival during transport and maturation in the field, and be more resistant to predation and stressful abiotic conditions.

Summary of potential commercial benefits to the fishing community of the research results: Traditional off-bottom aquaculture cannot satisfy the tremendous demand for oysters. We propose to develop a new inexpensive technique to improve the return on investments states are making towards on-bottom aquaculture. By stimulating oysters to grow stronger shells, we will reduce their predation risk and susceptibility to adverse conditions in the field as well as increase their marketability as thicker shelled oysters are easier to transport and shuck. Increasing the number of oysters which survive to maturity will not only help revitalize this decimated fishery, but also speed reef recovery efforts, providing essential habitat to other commonly fished species.

Proposal #: 20SER019-032

Project Title: Resolving Barriers to Sustainable Fishery Certification for the Gulf of Mexico Federal Otter Trawl Shrimp Fishery

Applicant: LGL Ecological Research Associates, Inc.

Priority Addressed Priority #1 – Promotion, Development and Marketing

Principal Investigator: Dr. Benny J. Gallaway, bjg@lgtex.com

Abstract: The federally-permitted penaeid shrimp fishery of the Gulf of Mexico is one of the nation's most valuable fisheries. However, bycatch associated with shrimp trawls presents a serious challenge for meeting requirements for certification as a sustainable fishery. Without such certification, the shrimp industry is likely to lose market share to international competitors and may have difficulty selling their product to major seafood buyers (Walmart, Kroger, etc.). After decades of effort to reduce bycatch, two barriers for certification of the federal otter trawl fleet remain: low observer coverage and the "modified characterization protocol" of bycatch whereby a large percent is unidentified (<https://tinyurl.com/SustainableShrimp>). Work to resolve the first barrier is underway; the second is the basis of this proposal. Through this project we will work with industry and NMFS collaborators to (1) collect and fully characterize bycatch obtained by the NMFS observer sampling program and (2) quantify changes in bycatch composition for the period 1992 to 2021. A comprehensive bycatch database will be provided to NMFS and a full report of the results will be widely distributed to relevant stakeholders and the general public. This project will benefit the shrimping industry, the NMFS observer program, fisheries managers, and U.S. consumers.

Summary of potential commercial benefits to the fishing community of the research results:

Given our ongoing dialog with sustainable fishery certification experts, we are confident that the proposed work will resolve the most difficult barrier to certification of the Gulf of Mexico federal otter trawl shrimp fishery. Our project involves producers, fish dealers and processors; government scientists and certification experts. Results will help the shrimp industry to meet the requirements of current major buyers, promote additional market demand from buyers requiring certification (e.g. from Europe, where there is a large demand for large shrimp with sustainability certifications), improve public perception, and thus contribute to the stability and viability of the shrimp fishery.

Proposal #: 20SER024-060

Project Title: Strengthening the Supply Chain for Lionfish to Promote Fishing and Protect Native Species

Applicant: Reef Environmental Education Foundation

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Dr. Allison Candelmo, PhD, alli@REEF.org

Abstract: Over the past several years, design and testing of innovative, lionfish traps that are baitless and FAD-based has yielded encouraging results. Non-containment lionfish traps that reduce bycatch, eliminate risk of ghost fishing and take advantage of the natural tendency of lionfish to associate near structure and manmade objects have been tested by several research and volunteer organizations, in consultation with Dr. Steve Gittings (NOAA), who designed the traps. Our objectives are to test and modify the NC trap to optimize design to ensure; gear deployment speed and accuracy (near target site), deployment success (opens successfully), and minimal risk of bycatch or movement of traps post-deployment, and (2) study trap efficacy or its ability to be used to capture lionfish in mesophotic habitats. The proposed project will build off years of experience by groups that have been directly and indirectly examining the use of traps to capture lionfish from deep-water habitats. The collaboration of Florida Keys commercial trap fishermen with the PI, project manager and contributing partners listed below will provide the intellectual and field support needed to ultimately determine if a NC lionfish trap is an effective and viable fishing method to target populations in deep-water.

Summary of potential commercial benefits to the fishing community of the research results: This project directly impacts fisheries through the development of a trap technology that will (1) strengthening an existing, underdeveloped market and (2) create opportunities for U.S. fishing communities. It better connect segments of the lionfish supply chain, specifically from harvesting to processing by targeting under-fished populations in mesophotic habitats. Included within the scope of the project, is strong collaboration with the professional fishing community to improve trap design and catch rates by utilizing their knowledge for successful deployment and site selection. Widespread trap use may significantly reduce the impacts of lionfish on native deep-water communities, including those of commercial interest.

Proposal #: 20SER026-012

Project Title: Application of IMTA-Technology to Revive and Sustain Livelihood of Fishing Communities in Puerto Rico

Applicant: Florida Institute of Technology

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Dr. Ralph Turingan, turingan@fit.edu

Abstract: The 70% decline in the total fish and shellfish landed, especially along the southwest coast of Puerto Rico, since 2001, a loss in fisheries revenue of about 50%, is likely caused by an assemblage of drivers including overfishing, habitat loss, pollution, climate change, and hurricanes including Irma and Maria in 2017. This proposed work is the first application of the Integrated Multi-Trophic Aquaculture (IMTA) technology to revitalize and sustain the livelihood of coastal fishing communities in Puerto Rico. The IMTA framework involves the simultaneous culture of marketable species, each occupying a different niche within the system, thus, playing complementary roles in mitigating the adverse impacts of aquaculture effluents on the ecosystem. In the IMTA system, the basic flow of food/energy are as follows: (1) organic wastes and uneaten feeds high in protein from fish cages or tanks (2) serve as food for organicextractive species including sea urchins and oysters, and (3) inorganic wastes are captured by seaweeds (inorganic-extractive species). The key species in each of these components is edible and marketable, thus, food and income from one IMTA operation is at least three times more than a traditional monoculture (single-species production) method.

Summary of potential commercial benefits to the fishing community of the research results:

As in coastal small-scale fishing communities worldwide, mariculture remains the only viable option to provide food, income, and livelihood, and revitalize and sustain traditional fishing communities in Puerto Rico. In this proposed pilot work, we will train fishermen how to construct and use recirculating IMTA to produce pompano, oyster, and seaweed, and provide continuing education to them in the U. Puerto Rico Marine Sciences Field Laboratory. At the end of this 2-year pilot study, we would have provided additional income and food supply to 50 fishing families that have been severely affected by hurricanes Irma and Maria.

Proposal #: 20SER031-026

Project Title: Novel technology for development for an in-situ shellfish red tide toxin biosensor and for the assessment of land-based recirculation depuration as a red tide mitigation strategy

Applicant: Mote Marine Laboratory

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Dana Wetzel, Ph.D., dana@mote.org;

Abstract: This study explores new technology that promotes sustainable US seafood production and harvesting and leads to strengthening of existing markets and opportunities in shellfish communities. Red tide blooms in recent years have decimated shellfish fisheries and industry needs technology for in-field assessments of red tide toxins that would correlate with regulatory protocols. Current complex procedures force farmers to leave safe product in the water or hold harvested product for extended periods until their status can be confirmed using time-consuming laboratory methods. This conundrum often results in a lag time where farmers must harvest and hope for a good outcome. A reliable and approved field tester could lower the risk and improve the bottom line of, farmers harvesting during a red tide quarantine, allowing the farmer to make a decision on the spot about whether to harvest the product. This project also has the potential to demonstrate that depuration of red tide toxins from shellfish using land-based recirculating systems is feasible. These protocols could enable farmers and regulatory agencies to begin developing commercially feasible depuration systems. Like the potential for a field tester, an approved depuration system would reduce risk and improve bottom lines for shellfish farmers in areas affected by red tide.

Summary of potential commercial benefits to the fishing community of the research results: Red tide is devastating for shellfish farmers in affected areas who have seen an escalating number of red tide related closures of their farms resulting in millions of dollars of lost revenue and numerous lost jobs, and creating economic uncertainty. Tools such as an in-situ toxin tester and effective toxin depuration protocols could lower the risk and improve the bottom line of the Privileged, Confidential, Commercial, or Financial Information - Limited Use shellfish farming industry. With new technology that responds to the needs of the shellfish farmers in red tide impacted regions, these economically valuable communities have the chance to regain, and exceed, their previous prominence in shellfish production

Proposal #: 20WCR004-018

Project Title: Utilize an industry-seine fishing vessel to enhance data collection and improve assessment of Pacific Coast Coastal Pelagic Species for the benefit of the fishing industry, marketing enterprises and our fishing communities

Applicant: Ocean Gold Seafoods, Inc.

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigators: Greg Shaughnessy, gshaughnessy@oceancos.com; Michael M. Okoniewski, gshaughnessy@oceancos.com; Lorna L. Wargo, Lorna.Wargo@dfw.wa.gov

Abstract: The Coastal Pelagic Species industry feels strongly that it has a stake in robust fisheries management of this complex and dynamic assemblage, which can only be achieved with extensive data collection efforts. Initiated by industry, this collaborative industry-federal-state research project builds on previous success, using an industry purse seine vessel to conduct complementary nearshore acoustic surveys and sampling in conjunction with a NOAA-Southwest Fisheries Science Center Acoustic Trawl Methodology (ATM) survey and the Washington Department of Fish and Wildlife (WDFW).

The overarching goal of this project is to expand data collection and increase spatial coverage for commercially important Pacific sardine and other coastal pelagic species (CPS) known to exist in nearshore waters too shallow to be surveyed by the federal research vessel. In order to contribute to sustainable management and generate environmentally compatible socioeconomic benefit to CPS harvesters and processors, the FV Lisa Marie, over 35 days in summer-fall 2020, will conduct acoustic and biological sampling of the nearshore CPS assemblage from the Canadian/U.S. border to northern California in conjunction with the NOAA ATM survey vessel; and conduct additional studies with the WDFW to evaluate sampling strategies.

Summary of potential commercial benefits to the fishing community of the research results: This project aims expand and improve the data collection and spatial coverage for Pacific sardine and other coastal pelagic species (CPS) via collaborative research. Fishermen and seafood processors stand to benefit through its potential to document nearshore biomass CPS that may not be observed in current federal surveys. Improved science potentially strengthens harvest opportunity; the commercial benefit manifests itself in several ways. 1) improvement of fleet and processor operational efficiencies by better planning for the fishery; 2) building and stabilizing markets; and 3) cash income from the fish and vessel activity to our communities.

Proposal #: 20WCR006-004

Project Title: Combining underwater video and hook and line surveys of untrawlable areas in the Cowcod and Rockfish Conservation Areas to inform harvest opportunities and management measures

Applicant: San Jose State University Research Foundation

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigators: Dr. Rick Starr, Starr@mlml.calstate.edu; Dr. Mary Gleason, mgleason@tnc.org

Abstract: This project will address the S-K Priority #2- Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting. This project brings together the fishing industry, NGOs, state and federal agencies, and academia to demonstrate how new technology (stereo video lander) and standardized fishing surveys can be combined to provide information about the distribution, density, and size structure of demersal groundfish in untrawlable habitats to inform stock assessments, spatial management measures, and fishing opportunities. By conducting visual surveys in the untrawlable parts of the Cowcod and Rockfish Conservation Areas (CCAs, RCAs, established in 2001) and comparing results with the density of demersal species as determined by NMFS hook and line surveys, we will provide data to support stock assessments on important groundfish species and inform management decisions that promote increased fishing opportunities in the CCAs. Also, we will gather information about habitats for the future potential of using habitat maps in the stock assessment process. The proposed research is in response to data gaps currently identified in groundfish stock assessments species associated with untrawlable habitats as well as in the PFMC's Research and Data Needs document.

Summary of potential commercial benefits to the fishing community of the research results: Currently, many groundfish stocks on the US West Coast have been rebuilt. This creates a paradox in which catch allocations of some rebuilding species are still quite low, although their populations have been rebuilt, thus greatly constraining fishing opportunities. Our work will inform NMFS Stock Assessment scientists as they strive to estimate allowable catches for areas that may soon be reopened to fishing. More information about the structure of fished stocks will reduce the uncertainty in stock assessments, thus leading to more reliable (and thus higher) estimates of allowable catch. Also, we will charter fishing boats.

Proposal #: 20WCR007-003

Project Title: Creating new products and markets – Development of techniques for the cultivation of monkeyface pricklebacks as a sustainable alternative to unagi

Applicant: San Jose State University Research Foundation

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Scott Hamilton, shamilton@mlml.calstate.edu

Abstract: Unagi, or freshwater eel is extremely popular in sushi restaurants and Japanese cuisine. However, wild populations have declined dramatically and current farming practices are not sustainable. Monkeyface pricklebacks (*Cebidichthys violaceus*) are eel-like fishes that live in rocky intertidal and shallow subtidal habitats on the U.S. West Coast. This species is a potential alternative to freshwater eels traditionally used for unagi and could provide a highly sustainable product. Monkeyface pricklebacks are herbivorous, consuming over 60 species of algae and marine plants. It is the herbivorous nature that make this species particularly attractive for aquaculture development. The primary goal of our project is to partner with industry (TwoXSea and Monterey Bay Seaweeds) and scientists at NOAA to develop techniques to farm 2 monkeyface pricklebacks, process the product into an alternative to unagi, and begin to develop a new market. We will (1) conduct research on optimal temperatures for reproduction, larval rearing, and growth; (2) conduct controlled feeding studies to measure growth on single and mixed-species seaweed diets and novel seaweed-based pellets produced with our fish feed mill; and (3) create a production manual for culturing monkeyface pricklebacks and other herbivorous species, while testing and promoting the product as a sustainable alternative to unagi.

Summary of potential commercial benefits to the fishing community of the research results: The project has the potential to create jobs through the production, distribution, and marketing of a new seafood product as a sustainable alternative to unagi. One of the hallmarks of the MLML Aquaculture Center since its inception, is that research conducted at our facility is non-proprietary in nature and cannot be used to benefit a single business. Thus, all the information learned through this project will be made available to other entrepreneurs that are interested in farming this or related herbivorous species. We have also included funding to work collaboratively with commercial fishermen to obtain the broodstock for the proposed experiments.

Proposal #: 20WCR010-020

Project Title: Toward a More Sustainable and Data-driven Management Paradigm for the Vermilion Rockfish Complex

Applicant: Pacific States Marine Fisheries Commission

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigators: Jim Benante, jbenante@psmfc.org; Mike Thompson, mthompson041@cox.net; Ken Franke, kennethfrankesac@gmail.com

Abstract: Stock assessments generate essential scientific information necessary to inform the conservation and management of fish stocks. The Page 1 of 19 Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires using the best scientific information available to manage U.S. commercial and recreational fisheries, preferably managing individual stocks as a taxonomic unit throughout their range to the extent practicable (National Standard 3). For rockfish species within the genus *Sebastes*, the ability to provide the best scientific information available is challenging due to taxonomic issues. Recent research has revealed that historically-defined taxonomic units have obscured species-level genetic heterogeneity which may be expressed through different distributional and/or biological characteristics of the component groups. Of particular concern is the vermilion rockfish (*S. miniatus*) stock along the west coast and its virtually indistinguishable cryptic pair – the sunset rockfish (*S. crocotulus*). The complex supports one of the most valuable recreational fisheries on the west coast, and two previous attempts to assess the assemblage were not endorsed for setting harvest guidelines by the Pacific Fishery Management Council (PFMC) in part because of these species-level differences.

Initial efforts to separate the species using assays targeting mitochondrial DNA (mtDNA) markers had limited success due to mitochondrial introgression (i.e., the entry or introduction of a gene from one gene complex into another [as by hybridization]) from vermilion into sunset. Although nuclear markers such as microsatellites are able to definitively separate the species, associated lab techniques are costly, time-consuming and not appropriate for the production-level analysis needed to process specimens into usable data for stock assessments.

The proposed project will conduct a genomic analysis to distinguish the vermilion rockfish stock along the west coast from sunset rockfish using tissue samples previously collected during fishery-independent resource surveys. Specifically, we propose to use high-throughput sequencing technologies to identify and incorporate nuclear markers known as single nucleotide polymorphisms (SNPs) into an assay that definitively separates the two species. Such an analysis would then enable species-specific demographic and biological analyses to be undertaken, as well as separate samples for the purpose of developing species-specific indices of abundance. This project will leverage a large, existing collection of DNA samples compiled from multiple sources including fishery-independent research surveys, prior genetics research projects, and collections made opportunistically by sport and commercial fishing industry partners. The majority of specimens were obtained from NOAA/NWFSC's Southern California Shelf Rockfish Hook and Line Survey (HLS) and date back to 2004. The HLS was developed in the early 2000s in collaboration with the local commercial passenger fishing vessel (CPFV) industry as a means of improving the information available for stock assessments for groundfish species associated with untrawlable habitat. All HLS specimen and data collections to date are a result of this partnership

between scientists and industry. This includes the efforts of CPFV captains Mike Thompson (project co-PI) and Joe Villareal (project collaborator) who have been involved with the HLS since its inception.

Summary of potential commercial benefits to the fishing community of the research results: The expected outputs from this proposed project will be available for future vermilion rockfish stock assessments, and preliminary results will be shared as they become available with the assessment community to inform discussions related to the timing and prioritization of future stock assessments. Expected benefits of this research include important catch, index, and biological composition data inputs to support a stock assessment for this important species complex and demonstrating how genetic advances can be explicitly and successfully integrated into fishery management. Benefits of a successful stock assessment include the provision of greatly improved scientific advice to the PFMC to determine species-specific sustainable harvest levels with less uncertainty and less risk.

Proposal #: 20WCR014-029

Project Title: From stock health to public health – revitalizing West Coast groundfish with a health-focused marketing program

Applicant: Positively Groundfish

Priority Addressed Priority #1 – Promotion, Development and Marketing

Principal Investigator: Jana Hennig, jana@positivelygroundfish.org

Abstract: Abstract: The West Coast IFQ trawl groundfish fishery has experienced a remarkable ecological recovery since its collapse in 2000. However, the fishery is now struggling with low market demand which causes the fishery to be underutilized and undervalued. To unlock the full economic potential of the fishery, Positively Groundfish proposes a project that will promote key rockfish and sole species by focusing on their health and nutritional benefits. The one-year long project (10/01/20 - 09/30/21) breaks down into three key work tracks: 1) a comprehensive nutrient analysis of ten commercially important groundfish species; 2) a consumer messaging appeal study to determine the most viable target consumer groups and messaging /positioning; 3) a marketing outreach campaign that includes trade marketing, health event-based sampling, social media influencer marketing, paid media partnerships and public relations.

Summary of potential commercial benefits to the fishing community of the research results:

This project will support the IFQ trawl groundfish fishery in reaching its full economic potential within sustainable limits, and bring direct economic benefits to West Coast fishing communities. Greater differentiation and consumer appreciation for these underutilized and undervalued species would not just increase harvest volumes and operational efficiencies (from greater economies of scale), but it would also drive up their price-per-pound and make them less vulnerable to price pressures from foreign imports. The proposed project seeks to find a persuasive basis on which to market these groundfish species; it will determine the best way to communicate these benefits, and then run an outreach campaign that targets a new group of health-conscious consumers, and that can garner the necessary media attention. Moreover, the results of this project's comprehensive nutrient analysis will be publically available and enable the entire seafood industry to better market these species and improve consumer appeal of US wild-caught seafood. Ultimately, this may aid in improving public health by persuading American consumers to eat more seafood in general and edge closer to USDA's dietary guidelines.

Proposal #: 20WCR019-011

Project Title: Consumer Acceptability and Shelf-life Assessment of Frozen Seafood for Market Success

Applicant: Oregon State University / Oregon Sea Grant

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

Principal Investigator: Jamie Doyle, jamie.doyle@oregonstate.edu

Abstract: This project seeks to determine shelf life (nutrient density, oxidation, texture) and consumer acceptability of four types of frozen seafood stored in two different freezers, commercial/industrial and home, over 18 months, and to develop and pilot educational outreach efforts about frozen seafood. Past research shows that consumers find frozen seafood to be as good as, if not better, than fresh (never frozen) products. This project combines the shelf life testing with extensive seafood industry input to guide the research design/questions, and help package the past information and new results in ways that can and will be used by industry.

Summary of potential commercial benefits to the fishing community of the research results: [W]e are conducting research that has the potential to develop “science and technology based pilot projects” that would lead to the strengthening of markets for frozen seafood and increase consumer access to and confidence in frozen products. Our project makes connections from the moment a fish is landed and frozen to marketing and consumers; the results have the potential to impact fishermen, consumers, and retailers, leading to small fishermen accessing more markets, consumers accessing more products, and less waste along the supply chain. This project has the seafood industry (i.e., fishermen, seafood marketers, retailers, chefs) built into it, and their guidance is a critical component of making this research relevant and usable.

Proposal #: 20WCR020-028

Project Title: A Modern Approach to a Classic Catch: Full Utilization of Tuna Landings in San Diego, CA

Applicant: Catalina Offshore Products

Priority Addressed Priority #1 – Promotion, Development and Marketing

Principal Investigator: Dave Rudie, Rudie.Dave@gmail.com

Abstract: San Diego was once known as the “Tuna Capital of the World,” and, at its peak, the tuna industry was San Diego’s biggest revenue generator behind the Navy and aircraft industry. That changed in the 1980s as local canneries shifted operations overseas. There was a resurgence in tuna landings about 5-years ago when Catalina Offshore Products’ (COP) began marketing tuna from longline vessels that relocated from Hawaii to San Diego. A proportion of these tuna are of the top grades, the highest quality, and big sellers for the sushi, sashimi, seared tuna and poke markets. Unfortunately, lower-grade cuts are difficult to market due to their offcolor, and are often discarded. In addition, about 30 percent by weight of the tuna remaining after the fish are loined (e.g., head, fins, bones, trims, skin, and bloodline) are discarded. The goal of this project is to achieve full utilization of processed tuna and to identify significant economic opportunities for tuna and tuna-like species in the San Diego seafood supply chain by developing culinary processes for using lower grades of tuna, as well as finding non-culinary uses for body parts such as the oil, skin, and bones that are currently wasted.

Summary of potential commercial benefits to the fishing community of the research results:

Full utilization of the entire fish addresses food waste and will add value to the entire seafood supply chain, including fishers. Utilization and value-added processing of lower grade cuts adds more fish protein to the market at a greater diversity of price points. In addition to culinary uses, fish parts typically discarded can provide valuable non-culinary raw ingredients for human consumption (e.g., nutritional products) and non-human consumption (e.g., aquaculture feed). This effort to move towards improved food and waste management in the San Diego tuna seafood supply chain will provide a roadmap scalable to other fisheries and communities. The project supports a number of initiatives including the federal interagency Winning on Reducing Food Waste Initiative

Proposal #: 20WCR025-031

Project Title: Feasibility and Design of a Live Fish Auction – using San Diego, Ca as a Blueprint

Applicant: Michael Conroy

Priority Addressed Priority #1 – Promotion, Development and Marketing

Principal Investigator: Michael Conroy, mike@wecofm.com

Abstract: The Principal Investigator is proposing to work with NOAA economists, the Port of San Diego, fishermen, fishery associations, buyers and processors, and other interested stakeholders to inform the design and operational aspects of a future fish auction in the Port of San Diego. It is the intent of the Investigators, Co-investigators and Collaborators that the Project’s final product would be an exportable blueprint/guide/model that other U.S. Cities/Regions could reference when analyzing the feasibility and design of a fish auction. Fresh fish auctions historically and presently represent a significant share of global fish sales transactions. Despite their proven efficiency, fish auctions are rare in the US and no large-scale auction exists to serve the west coast fishing industries. The project directly addresses Priority #1 – Promotion, Development, and Marketing. The development of a fish auction in San Diego would introduce an efficient transaction mechanism to benefit fishing businesses at sea and on shore and expands the market demand for domestic seafood landed along the US west coast.

Summary of potential commercial benefits to the fishing community of the research results:

Establishment of a fish auction would directly benefit U.S. fishermen and the local fishing community by accommodating larger volumes of supply, providing an efficient price setting mechanism, and expanding demand for domestically caught commercial seafood. While focused on San Diego, the research results, as documented and presented, are intended to be exportable to fishing communities throughout the United States. Additional potential benefits include; but are not limited to: increased revenues to fishermen and dependent businesses; increased public awareness of domestic sources of seafood; and establishment of direct marketing opportunities.
