SBIR

Small Business Innovation Research Program

ABSTRACTS OF AWARDS FOR

FISCAL YEAR 2020

PHASE I

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

INTRODUCTION

The Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), through the Small Business Innovation Research (SBIR) program, has awarded 21 Phase I grants for FY 2020. These awards are up to $150,000 each totaling approximately $3.1 million. The awards are for a six-month effort to demonstrate the feasibility of innovative approaches to the research topics identified in the "DOC/NOAA SBIR Program Solicitation for FY 2020." Abstracts of the successful Phase I proposals submitted under this solicitation, and brief comments on their anticipated results are provided in this publication.

The SBIR program is highly competitive. A total of 76 proposals were received by DOC/NOAA in response to its FY 2020 solicitation. Internal and external scientists and/or engineers independently reviewed the proposals. With the funds available, 21 were selected for an award. Final selection was based upon the results of the reviews, and the project's potential for commercialization.

FY 2020 Phase I List of Awardees

Award Number	Company Name	Subtopic Number
NA20OAR0210317	AAPlasma, LLC	9.1.01
NA20OAR0210318	DIVEVIZ, LLC	9.3.02
NA20OAR0210319	Aerodyne Research, Inc.	9.5.02
NA20OAR0210320	CD3, General Benefit Corporation	9.1.02
NA20OAR0210321	Ward Aquafarms, LLC	9.1.01
NA20OAR0210322	Pacific Hybreed, Inc.	9.1.03
NA20OAR0210323	Creare LLC	9.2.02
NA20OAR0210324	Betterdex Inc.	9.3.02
NA20OAR0210325	Charles River Analytics Inc.	9.4.01
NA20OAR0210326	Hydronalix, Inc.	9.4.01
NA20OAR0210327	SafetySpect Inc.	9.2.05
NA20OAR0210328	CFD Research Corporation	9.3.02
NA20OAR0210329	Lynntech, Inc.	9.1.02
NA20OAR0210330	Michigan Aero	9.3.02
NA20OAR0210331	Azavea Inc.	9.5.03
NA20OAR0210332	Shellfish Solutions	9.1.01
NA20OAR0210333	Skyward, Ltd.	9.4.01
NA20OAR0210334	CVision AI, Inc.	9.2.05
NA20OAR0210336	INNOVIM LLC	9.5.03
NA20OAR0210342	Cruyningen, Izak van	9.4.02
NA20OAR0210372	Kraenion Labs LLC	9.5.03

FY 2020 PHASE I AWARD WINNER

FIRM:	AAPlasma, LLC 3401 Grays Ferry B197-221 Philadelphia, PA 19146
AWARD:	$149,949.00
PHONE:	949-838-4311
E-MAIL:	charles@aaplasma.com
PRINCIPAL INVESTIGATOR (PI):	Charles Bailey
TITLE OF PROJECT:	Non-Equilibrium Short-Pulsed Discharge for Removal of Antibiotics and Pathogens from Water used in Aquacultural Facilities
SUBTOPIC NUMBER:	9.1.01

TECHNICAL ABSTRACT:

Seafood consumption in the United States has risen to over 50% per capita over the last 25 years with over 75% of total U.S. seafood consumption coming from import. These trends, if continued, place a high importance on the safety aspect of seafood trade. Despite the lack of evidence supporting higher risk in imported food, many of the U.S. seafood import sources are located in tropical areas where bacteria and toxin hazards are greater. This concern is further exacerbated by the increasing trade deficit highlighted by the 2004 USDA Seafood Safety and Trade study. In 2001 alone, the United States imported $6.8 billion more than exported. The increasing amount of aquacultural activities around the world have also led to amplified antimicrobial action and, in some instances, heavy use of antibiotics. Although most countries with a significant aquaculture industry exercise responsible controlling action, there is still some concern over prophylactic use of antibiotics, rather than anaphylactic use, increasing the potential for proliferation of antibiotic resistant bacteria (ARB) in aquacultural environments. In addition, higher stresses on aquacultural facilities driven by the growing demand for seafood has exacerbated the number of pathogens and organic toxins that threaten fish, bivalves, and other aquatic organisms of interest. Some water treatment processes can lyse bacteria, intact remnants of pathogenic genes are often released into the environment can eventually be taken up by other cells through natural transformation. A recent study published in Water Research, supports the probability that chemical agent water treatment such as chlorination can drastically intensify eARG uptake and increase ARB transmission. Furthermore, the removal efficiency of organic toxins and antibiotics themselves during water treatment is highly variable, depending on the toxin's physicochemical properties and the design and water treatment conditions of the aquaculture site.

SUMMARY OF ANTICIPATED RESULTS:

In the framework of this SBIR Phase I project, AAPlasma will design, develop, and evaluate a pulsed spark discharge system for its implementation in aquacultural facilities to prevent proliferation of waterborne pathogenic microbes and to dissociate antibiotics. The main goal of this SBIR Phase I project is to investigate the efficacy of direct non-thermal plasma in water to inactivate pathogenic bacteria, dissociate toxins of concern, and evaluate the potential risks of this plasma-based approach on fish and similar in-demand marine organisms.

FY 2020 PHASE I AWARD WINNER

FIRM:	DIVEVIZ, LLC 5010 Saratoga Ave Unit 3 San Diego, CA 92107
AWARD:	$149,987.00
PHONE:	727-698-5756
E-MAIL:	chris@diveviz.com
PRINCIPAL INVESTIGATOR (PI):	Bryan Cheezem
TITLE OF PROJECT:	Developing a forecasting model for ocean visibility through crowdsourced data
SUBTOPIC NUMBER:	9.3.02

TECHNICAL ABSTRACT:

The DiveViz platform being developed through this SBIR will communicate accurate real-time and forecasted ocean visibility reports. It is a prognostic tool that will lead to more coordinated and timely responses to high visibility events for the recreational, commercial, scientific, and military diving communities and improve advanced activity planning for all ocean activities. The primary impediment to visibility forecasting is a total absence of a single, global repository for daily visibility data and, alarming, there is no publicly available historical source of visibility data. DiveViz uses predictive analytics and machine learning to address the numerous influences that must be accounted for in visibility forecasting, including physical factors like currents, wind, waves, storm patterns, near shore rainfall, upwelling strength, and thermohaline circulation, as well as biological factors including algae blooms, nutrient inputs, and human activity, but without any historic ocean visibility data researchers cannot begin this analysis. DiveViz will engage the recreational diving community to crowdsource the first dataset of visibility reports and in collaboration with the Scripps Institute of Oceanography, begin refining the forecasting algorithm. This proposal supports the NOAA's goal of increased engagement, awareness and understanding of the ocean by facilitating public access, commercial enterprise, scientific expeditions, and military training and operations.

SUMMARY OF ANTICIPATED RESULTS:

DiveViz is a platform that provides accurate ocean visibility reports and forecasts to the diving industry. Currently, there is no provider of global diving conditions and no accurate method for predicting future visibility. DiveViz will ensure that the millions of Scuba divers and snorkelers know when to plan their dives and know whether to spend their time and energy executing it. Diving in low visibility leads to poor diving experiences, safety concerns, and less recreational diving. Additionally, there are oceanographic research institutes who have failed expensive expeditions due to poor visibility, and the military has similar struggles.

FY 2020 PHASE I AWARD WINNER

FIRM:	Aerodyne Research, Inc. 45 Manning Road Billerica, MA 01821
AWARD:	$150,000.00
PHONE:	978-932-0272
E-MAIL:	dgordon@aerodyne.com
PRINCIPAL INVESTIGATOR (PI):	David Gordon
TITLE OF PROJECT:	Automated Monitoring of VOCs with a Compact Gas Chromatography-Proton Transfer Reaction Mass Spectrometer (GC-mVocus)
SUBTOPIC NUMBER:	9.5.02

TECHNICAL ABSTRACT:

Volatile organic compounds (VOCs) are emitted from a wide variety of biogenic and anthropogenic sources. VOCs transform in the atmosphere, forming ozone and oxygenated VOCs (OVOCs), which in turn can form fine particulates or condense onto preexisting particulate matter (PM). Both ozone and fine PM are deleterious to human health and alter the Earth's climate. Measurements of (O)VOCs are necessary to model the sources and sinks of harmful atmospheric chemicals. Progress in this area is limited, however, by the lack of field-deployable instrumentation capable of proving detailed molecular information. The goal of the proposed work is to develop a hybrid gas chromatograph and miniature proton transfer reaction Vocus mass spectrometer (GC-mVocus) instrument capable of real-time molecular-level chemical characterization of VOCs and OVOCs. Specific tasks in Phase I include characterizing the mVocus, developing the GC method, and developing automated data analysis and display software for the combined instrument. The result of Phase I will be the design and operating procedure of a prototype GC-mVocus that will be built and demonstrated in Phase II in a field campaign. The result of Phase II will be a GC-mVocus instrument that is capable of real-time, robust, and sensitive measurements of VOCs and OVOCs.

SUMMARY OF ANTICIPATED RESULTS:

We expect that the GC-mVocus will be ideally suited to monitoring sites and to academic and government research laboratories. China, India, and the European Union represent large potential markets as they increase their focus and funding for solving major air quality issues. For example, the European Aerosols, Clouds, and Trace gases Research Infrastructure (ACTRIS) Network also has a nascent effort to characterize VOC emissions across the continent. We also intend the GC-mVocus to be a useful tool for monitoring in industrial applications such as at oil refineries in which specificity is needed to detect toxic chemicals such as ethylene oxide.

FY 2020 PHASE I AWARD WINNER

FIRM:	CD3, General Benefit Corporation 1865 Ashland Ave. Saint Paul, MN 55104
AWARD:	$150,000.00
PHONE:	952-212-6576
E-MAIL:	ed@cd3station.com
PRINCIPAL INVESTIGATOR (PI):	Edgar Rudberg
TITLE OF PROJECT:	Continuous eDNA Monitoring for Early Detection of Aquaculture Diseases
SUBTOPIC NUMBER:	9.1.02

TECHNICAL ABSTRACT:

As aquaculture increases productivity to meet worldwide demand, it faces an increasing threat from the spread of disease, aquatic organisms, and pathogens. However, biosensor technologies have not kept pace with the need to monitor these ever-increasing threats. In particular, biomonitoring has been limited by the need for continuous human presence, whether at the point of collection or in the laboratory. What is needed are biosensors that function as robustly and easily as a smoke-alarm, i.e. autonomous, reliable, in-field monitoring technologies capable of disseminating data in a straightforward way and in real-time to a broad range of personnel and decision-makers. CD3, in collaboration with the University of Montana's Flathead Lake Biological Station will seek to overcome these barriers. By testing various approaches to multiplex detection of aquatic pathogens, we will expand the capabilities of the "DNA-Tracker," meeting a critical benchmark for commercial adoption.

SUMMARY OF ANTICIPATED RESULTS:

The commercial potential of the DNA-Tracker is $1b+ in aquaculture. Additional markets include fisheries, resource management, water quality monitoring, defense, and biosecurity. The DNA-Tracker enables improved protein production, better food quality, and reduces risk for aquaculture farmers by monitoring eDNA in their ponds and pens for diseases, aquatic organisms, and pathogens. The DNA Tracker will enter a growing field of the U.S. biotechnology industry, a $112.4bn/year industry of which 16.4% of the market is agriculture and aquaculture technologies.

FY 2020 PHASE I AWARD WINNER

FIRM: Ward Aquafarms, LLC
51 North Falmouth Highway
North Falmouth, MA 02556

AWARD: $149,600.00

PHONE: 774-255-3030

E-MAIL: dan@wardaquafarms.com

PRINCIPAL INVESTIGATOR (PI): Daniel Ward

TITLE OF PROJECT: Connected shellfish grading system and integrated data management platform

SUBTOPIC NUMBER: 9.1.01

TECHNICAL ABSTRACT:

The project will develop a low-cost, connected, sorting system which utilizes smart cameras to measure dozens of oysters per minute, in three dimensions, and then sort into different size classes based on those data. Utilizing low-cost technology significantly reduces labor costs, while increasing the number of product offerings and simultaneously improving the reliability of each oyster grade. These data are then serialized to associate with a particular bag of oysters, and stored in the cloud. The serialized length/width/height data are associated with additional components such as harvest temperature, real-time, cellular-based temperature and location tracking sensors, as well as farm environmental data which are important to consumers, regulators and farmers. Separate interfaces allow farmers to know exactly which products are in which location, and how they are being handled all the way through to the final consumer. Regulators can log in and view harvest temperature and location, as well as shipping temperature through to the final consumer to ensure product quality, as well as rapid trace-back if a recall is necessary. Finally, consumers can view information about the particular bag of oysters they are purchasing, including harvest time and location, as well as temperature to increase quality standards throughout the industry.

SUMMARY OF ANTICIPATED RESULTS:

The goal of the project is to continue to develop and test a modular platform which can be modified to any particular growing area, species (of shellfish), or space restrictions, which can, at a minimum, measure, grade by any number of attributes, grade on the classification, and then count by grade and sort oysters for sale. The output data from the sorting platform will be stored in the cloud and integrated with many additional data sources. These data will then be visualized and presented to diverse user groups with different interfaces depending on the needs of each stakeholder group.

FY 2020 PHASE I AWARD WINNER

FIRM:	Pacific Hybreed, Inc. 10610 NE Manitou Park Blvd. Bainbridge Island, WA 98110
AWARD:	$149,862.00
PHONE:	206-799-7601
E-MAIL:	joth@pacifichybreed.com
PRINCIPAL INVESTIGATOR (PI):	Jonathan Putnam
TITLE OF PROJECT:	Identifying genetic markers of resistance to POMS (Pacific oyster mortality syndrome)
SUBTOPIC NUMBER:	9.1.03

TECHNICAL ABSTRACT:

Pacific oyster mortality syndrome (POMS), which is caused by the virus OsHV-1, has devastated oyster farming globally and threatens the $225 million shellfish aquaculture industry on the U.S. West Coast. Lacking typical treatment or control measures, POMS progresses rapidly, causing up to 100% losses; once detected in a growing area, the virus remains and spreads. On the other hand, breeding for POMS resistance has successfully diminished mortalities in France, Australia, and New Zealand, where POMS is established. This Phase I project aims proactively to gain a scientific understanding of mechanisms of genetic resistance to POMS in order (1) to accelerate identification of resistant animals in commercial, as well as natural, West Coast populations and (2) to establish a POMS-resistant but otherwise diverse base population for further genetic improvement. We will generate inbred Pacific oyster families at our breeding facility in Hawaii, challenge offspring from these families with different viral strains in a biosecure laboratory in Arizona, and expose other siblings from these same families to the less virulent virus in Tomales Bay, California. The most-resistant and most-susceptible families will be propagated for crosses and gene-mapping studies in Phase II, which will enable identification of genetic markers for POMS-resistance.

SUMMARY OF ANTICIPATED RESULTS:

The overall goal of this project is to identify genetic markers associated with POMS-resistance, which can be used, in turn, to identify POMS-resistant adults in farmed or wild oyster populations along the U.S. West Coast. We will develop a genetic test and offer a testing service to improve the POMS-resistance of commercial broodstocks. Pacific Hybreed's longer-term strategy, however, is to use this test in-house, as an integral part of its proprietary crossbreeding program for Pacific oysters, so that POMS resistance can be combined with other desirable traits, such as high yield, resilience to environmental stresses, and size uniformity at harvest.

FY 2020 PHASE I AWARD WINNER

FIRM: Creare LLC
16 Great Hollow Road
Hanover, NH 03755

AWARD: $149,361.00

PHONE: 603-643-3800

E-MAIL: jcw@creare.com

PRINCIPAL INVESTIGATOR (PI):   Jed Wilbur

TITLE OF PROJECT: Low Cost Ocean Temperature Profile Sensing

SUBTOPIC NUMBER: 9.2.02

TECHNICAL ABSTRACT:

Changes in ocean temperature have a profound impact on the productivity of fisheries and aquaculture. Sampling offshore ocean temperatures, particularly at depth, is challenging and expensive. As commercial fishermen are becoming more and more aware of the correlations between water temperature and harvest, opportunistic sampling from fishing gear can help fill this sampling need. Existing opportunistic sampling programs are hindered by the high cost (order ~$1,000) of sensor nodes and the need for integrating data-transmission hardware with the host ship. A simpler and less expensive approach is needed. Creare and our collaborators at the University of Maine propose to develop the Wireless Open Water Logger (WOWL), an open-source, inexpensive (<$100/unit price), and easy to use sensor for logging water temperature and depth. In Phase I we will design, fabricate and test a proof-of-concept WOWL sensor, integrate it with our existing online citizen science infrastructure, and demonstrate performance in laboratory and open water testing. In Phase II we will refine the WOWL design, develop supporting hardware, fabricate multiple units, and demonstrate performance in a scientifically relevant study.

SUMMARY OF ANTICIPATED RESULTS:

The project will provide fishermen and scientists with a cost-effective and reliable framework for monitoring ocean temperatures. In addition, the system will provide the scientific community with a set of tools for data review and analysis. The system will lower the per node cost of ocean temperature sampling studies, enabling increased spatial sampling. Improved knowledge of ocean temperatures will improve forecasting of fishery yield, allowing for better planning and management of fisheries.

FY 2020 PHASE I AWARD WINNER

FIRM:	Betterdex Inc. 401 19th St S #310 Birmingham, AL 35233
AWARD:	$149,366.00
PHONE:	330-719-7197
E-MAIL:	allenar@betterdex.com
PRINCIPAL INVESTIGATOR (PI):	Allena Rouse
TITLE OF PROJECT:	Engaging the Public with a Novel System for Cloud Type Estimation
SUBTOPIC NUMBER:	9.3.02

TECHNICAL ABSTRACT:

We will demonstrate the feasibility of a novel cloud type identification system that uses a voice application to collect surface observations. This capability meets NOAA's mission to understand and predict changes in climate, weather, oceans, and coasts and to share that knowledge and information with others. Many weather observing stations have replaced human observations with weather satellite monitoring or observations using automated instruments. A reliable method to infer cloud types from satellite images is still needed. Ground instruments cannot determine cloud type and are limited in their ability to distinguish middle and high cloud layers. Human observers are better able to determine cloud type and provide ground truth for analysis of satellite and instrument data. Our system aims to bridge the gap between man and machine to provide a robust method of collecting cloud type observations. The primary innovation is the use of a voice application in the cloud identification system. Recently, Voice User Interfaces (VUIs) were introduced to the market and adopted at an exponential rate as the public is innately drawn to conversational experiences. The proposed VUI will be optimized to meet both the unique needs of a cloud observation system and user engagement focused requirements.

SUMMARY OF ANTICIPATED RESULTS:

Preparing for Phase 3 commercialization, the Phase 1 effort will result in validation of a novel cloud type identification system. Through simulation, we will demonstrate the ability of the proposed system to identify cloud type data via a voice user interface. The Phase 1 efforts will provide the necessary models and specifications to develop, test, and validate a prototype application in Phase 2. During Phase 1, we will further evaluate the commercialization potential of government, education, and consumer markets. The end benefit will be a dynamic and entertaining experience that increases public engagement with weather data.

FY 2020 PHASE I AWARD WINNER

FIRM:	Charles River Analytics Inc. 625 Mount Auburn Street Cambridge, MA 02138
AWARD:	$149,989.00
PHONE:	617-491-3474
E-MAIL:	dstouch@cra.com
PRINCIPAL INVESTIGATOR (PI):	Dan Stouch
TITLE OF PROJECT:	Semi-autonomous Capabilities for the Operation of Unmanned Teams (SCOUT)
SUBTOPIC NUMBER:	9.4.01

TECHNICAL ABSTRACT:

Natural disasters and other severe weather events have the potential to create loss of life and damage property on a large scale. Preparing for and responding to these incidents is a complex, multi-phase process. NOAA's 2019-2022 Strategic Plan is to achieve the vision of a Weather Ready Nation to reduce the impacts of weather, water, and climate events and harness cutting-edge science, technology, and engineering to provide the best observations, forecasts, and warnings possible. UAS provide new sensing capabilities, keep humans out of harm's way, and can collect precise and actionable data when effectively supported by autonomy. We propose to design and demonstrate the feasibility of Semi-autonomous Capabilities for the Operation of Unmanned Teams (SCOUT). Our approach begins with requirements analysis and scenario development, includes hardware and software component design, and then focuses on prototyping UAS routing and object detection algorithms to demonstrate concept feasibility. SCOUT will allow Decision-Support Services (DSS) teams within regional Weather Forecast Offices (WFOs) to employ cost-feasible, small, semi-autonomous UAS to accomplish critical lifesaving operations, such as vertical profiling of critical meteorological data for localized forecasting, survey missions to mitigate severe weather effects, and proactive alerting of people of danger from imminent weather conditions.

SUMMARY OF ANTICIPATED RESULTS:

The derived product suite includes tools for natural disaster assessment and response, small ship survey and tracking, IED search and detection, wildlife survey, and radiological survey. SCOUT technology will be marketable as an appliqué kit with sensors and software and also enhance our commercial VisionKit product. These will directly benefit a number of federal (e.g., NOAA, FEMA, USFS, the 557th Weather Wing, USCG, DOT, NASA, and the National Center for Atmospheric Research (NCAR)), and local government (emergency management) agencies, as well as commercial (insurance industry) and non-profit (humanitarian relief agencies) organizations.

FY 2020 PHASE I AWARD WINNER

FIRM: Hydronalix, Inc.
1691 W. Duval Commerce Court Road, Ste 141
Green Valley, AZ 85614

AWARD: $149,999.00

PHONE: 520-797-3408

E-MAIL: sandy.dicosola@hydronalix.com

PRINCIPAL INVESTIGATOR (PI):   Sandra DiCosola

TITLE OF PROJECT: NOAA Aerielle SONAR UAS

SUBTOPIC NUMBER: 9.4.01

TECHNICAL ABSTRACT:

This proposed concept is a direct response to NOAA Topic 9.4.01, "Unmanned Aircraft System: Rapid Response for Natural Disaster" and will develop a Hybrid Unmanned Air System (UAS) called "Aerielle" equipped with a Humminbird SONAR imaging system that is commonly used by first responders. Aerielle will perform currently developed disaster response missions for UAS and additional under water search, recovery, and mapping missions performed by manned and unmanned surface craft with sonar. The interest to fully exploit the capabilities of unmanned aerial systems during natural disaster events by federal, state, and local organizations utilizing current sensors and platforms has identified the need for a next generation UAS capable of assisting in events of assessing situations and quick disaster response relief. Based on participation during many natural disaster events, Hydronalix has identified the need for a next generation UAS platform capable of performing advanced data collection, automatic victim recognition and data collaboration. The focus areas are: feasibility of adding acoustic instrumentation to a current UAS platform to perform sonar scanning of underwater structures for hazardous debris identification, automatic victim recognition in challenging landscapes, and near-real time collaboration utilizing cloud storage and mobile app development while evaluating current technology and mission needs.

SUMMARY OF ANTICIPATED RESULTS:

The U.S. Navy, fire departments, search and rescue personal as well as disaster relief organizations are potential commercial partners. Hydronalix has a strong commercialization transition experience having fulfilled $14 million in Phase III revenues shipping over 450 systems to customers and approximately $6 million in SBIR Phase I and Phase II research and development revenues. Hydronalix has a strong presence around the world with customers and partners in 23 foreign countries.

FY 2020 PHASE I AWARD WINNER

FIRM:	SafetySpect Inc.
	10100 Santa Monica Blvd, Suite 300
	Los Angeles, CA 90067
AWARD:	$149,264.00
PHONE:	703-896-2000
E-MAIL:	dcarroll@safetyspect.com
PRINCIPAL INVESTIGATOR (PI):	David Carroll
TITLE OF PROJECT:	Rapid detection of fish species and quality in the marketplace
SUBTOPIC NUMBER:	9.2.05

TECHNICAL ABSTRACT:

With increased seafood imports and limited monitoring, fraud and deception in seafood marketing is a growing safety and quality concern. The flesh of many fish species is similar in taste and texture and, therefore, it is difficult to identify species in fillet form. SafetySpect is developing a tabletop system incorporating multimode spectroscopy for real-time quality, adulteration and traceability (QAT) assessment of fish portions. The fish portion will be placed on the scanner plate for immediate analysis. The multimode spectroscopy measurement will be analyzed using algorithms developed using artificial intelligence methods and will display the fish species, quality and nutritional content in seconds.

Phase 1 of this project will determine the feasibility of extending existing multimode spectroscopic data analysis for assessment of fish species and quality from 10 to 50 species commonly consumed in the US. We will collect data on fish species, quality, and nutrient content and combine these with spectral data using four reference spectroscopic systems. We will demonstrate scalability and evaluate accuracy of machine learning classification algorithms for the assessment of fish quality, nutrient content, and species authentication. We will determine the design/market requirements and product characteristics for implementing the QAT system in the seafood supply chain.

SUMMARY OF ANTICIPATED RESULTS:

This technology has the potential to be used as a rapid species identification method in restaurants, seafood markets, and other points along the seafood supply chain. The QAT technology can protect restaurants or fish markets against vendors substituting high-quality seafood with cheaper imported seafood. It is expected that this technology will enhance current regulatory monitoring of the fish supply chain by preventing IUU fish from entering the U.S. market and providing consumers confidence that the seafood they purchase is harvested legally and responsibly. Successful Phase I results will initiate commercial product development and ultimately introduce a new standard for compliance.

FY 2020 PHASE I AWARD WINNER

FIRM:	CFD Research Corporation 701 McMillian Way NW, STE D Huntsville, AL 35806
AWARD:	$149,999.00
PHONE:	256-361-0796
E-MAIL:	elise.schultz@cfdrc.com
PRINCIPAL INVESTIGATOR (PI):	Elise Schultz
TITLE OF PROJECT:	Weather Risk Information and Impacts for School Systems Kit (WxRISK)
SUBTOPIC NUMBER:	9.3.02

TECHNICAL ABSTRACT:

The vision of Weather Ready Nation is achieved through the synthesis of the large number of NOAA products and services into meaningful and actionable information for community stakeholders and individual populations. The challenge is an increasing desire from these stakeholders and populations for forecast confidence and quantification of uncertainty in weather forecast products. Many community stakeholders find themselves in high-stakes weather-related decision making situations where they are left to their self-interpretation of forecast information or model output. This non-specialist self-interpretation can be dangerous and may be influenced by source bias, hype, or other situational-dependent factors. This Phase I effort seeks to address improving the communication of probabilistic forecast information used in school system closure decision-making with establishing the feasibility of the Weather Risk Information and Impacts for School Systems Kit (WxRISK) software system. WxRISK will provide spatial weather hazard risk information customized to a school district and include features to use pre-existing school communication channels to relay critical weather forecast information to parents ahead of impactful weather events. This software system will address the Weather Enterprise's goal of public-private partnerships to increase awareness of NOAA products and services and build a more Weather Ready and resilient nation.

SUMMARY OF ANTICIPATED RESULTS:

Commercialization of the Weather Risk Information and Impacts for School Systems Kit (WxRISK) software systems will provide school systems the ability to use location-specific weather information and probabilistic forecast confidence to make more informed decisions as to school closing or delays. This can increase savings to schools and local economies by reducing unnecessary closures or delays or prevent losses by proactively closing in advance of impactful weather to the district.

FY 2020 PHASE I AWARD WINNER

FIRM:	Lynntech, Inc. 2501 Earl Rudder Freeway South College Station, TX 77845
AWARD:	$149,991.00
PHONE:	979-764-2244
E-MAIL:	Christi.Parham@lynntech.com
PRINCIPAL INVESTIGATOR (PI):	Christi Parham
TITLE OF PROJECT:	Rapid, Simple Diagnostic for Pathogens in Marine Aquaculture
SUBTOPIC NUMBER:	9.1.02

TECHNICAL ABSTRACT:

Chronic malnourishment globally affects more than 800 million people with an expected population growth of another 2 billion over the next 30 years. Today, aquaculture accounts for nearly 50 percent of the world's food fish and is one of the fastest growing food-producing sectors. The biggest threat to global aquaculture production is infectious disease. While marine diseases are a naturally occurring aspect of an ocean ecosystem, the development of large-scale intensive aquaculture has resulted in the dramatic increase of disease outbreaks from a wide range of pathogens, including parasites, viruses and bacteria. These outbreaks can result in catastrophic economic losses for the industry. Lynntech proposes to develop an economical, rapid, user-friendly, field-ready diagnostic able to detect the presence of pathogens known to be major problems in the aquaculture industry. In this Phase I feasibility effort, we will establish our assay parameters to specifically detect aquaculture pathogens. During a future Phase II effort, we will expand our assay to detect additional pathogens and conduct field studies using a prototype developed during Phase II. The Lynntech detection assay will advance efforts to detect pathogens in the field, able to be used by untrained users onsite.

SUMMARY OF ANTICIPATED RESULTS:

Lynntech's point of use fish identification assay will have considerable commercial potential based on its ability to rapidly identify pathogens of concern to marine aquaculture. The pathogens investigated in this work are also those that pose threats to human health. Today, aquaculture accounts for nearly 50 percent of the world's food fish and is one of the fastest growing food-producing sectors. Industry-wide losses to aquatic animal diseases exceed US$6 billion per year. The development of a diagnostic able to be used onsite will result in faster response time to a disease outbreak, dramatically reducing economic loss.

FY 2020 PHASE I AWARD WINNER

FIRM: Michigan Aerospace Corporation
1777 Highland Drive, Suite B
Ann Arbor, MI 48108

AWARD: $149,978.00

PHONE: 734-564-7438

E-MAIL: ptchoryk@michaero.com

PRINCIPAL INVESTIGATOR (PI): Peter Tchoryk

TITLE OF PROJECT: OPEN WORLDS NOAA Portal

SUBTOPIC NUMBER: 9.3.02

TECHNICAL ABSTRACT:

Many people recognize how critical it is to understand our weather, climate, and environment. Educators already use NOAA data and models in working with students and their communities as part of their teaching and outreach. With the exponential growth in data, however, many of them struggle with accessing and managing that data. Evolving data formats and computing requirements make it very challenging. NOAA's mission is critical. We must find better ways to make NOAA's data more accessible and usable to educators who are teaching our next generation of decision makers. For the value of the data to be recognized, it must be used – and not just by data scientists. Michigan Aerospace and its partners propose to develop a web-based Portal with tools that greatly simplify access and use of NOAA data. We are passionate about providing educators and the general public with better access to this data and we believe NOAA's mission is essential. The Portal will highlight the value of NOAA's mission in meeting challenges that impact our daily lives. We will build upon our PLAIT.AI platform for monitoring watershed health. The Portal will allow users to ingest, process, visualize, and apply machine learning tools to NOAA data.

SUMMARY OF ANTICIPATED RESULTS:

We believe the proposed OPEN WORLDS NOAA Portal will demonstrate the critical importance of NOAA's mission by making NOAA's data and modeling tools more accessible to educators, the general public, and the next generation of decision makers. In doing so, we believe the Portal will lead to commercial benefit as organizations and companies can incorporate NOAA data directly and use our processing tools to provide solutions to urgent weather, climate, and environmental challenges. Customers include educators, ecologists, resource managers and forecasters who protect watersheds and other vulnerable ecosystems.

FY 2020 PHASE I AWARD WINNER

FIRM:	Azavea Inc. 990 Spring Garden Street, 5th Floor Philadelphia, PA 19123
AWARD:	$150,000.00
PHONE:	215-701-7713
E-MAIL:	cheetham@azavea.com
PRINCIPAL INVESTIGATOR (PI):	Robert Cheetham
TITLE OF PROJECT:	Advancing Flood Extent Delineation Modeling Using Synthetic Aperture Radar (SAR) Data
SUBTOPIC NUMBER:	9.5.03

TECHNICAL ABSTRACT:

The proposed research will advance flood inundation mapping and enhance situational awareness in disaster response situations through a combination of machine learning techniques and Synthetic Aperture Radar (SAR) data. One of the most difficult challenges during the early stages of a flood event is acquiring timely, unobstructed Earth observation data that can provide lifesaving insight into the situation on the ground and safely direct first responders to where they are needed most. Unfortunately, satellite images of the affected areas are often obscured by cloud cover. SAR is an especially promising technology for addressing these challenges, as it can continually gather ground-level data, regardless of cloud cover or even time of day. The complementary field of machine learning, and especially the sub-discipline of deep learning, offers significant potential for effectively monitoring and interpreting SAR imagery in near-real-time. By combining these two technologies, this project will support the rapid delivery of accurate flood inundation maps that will enable first responders, humanitarian relief organizations, and other decision-makers on the ground to effectively route resources and identify highly impacted areas, both during and following extreme weather events.

SUMMARY OF ANTICIPATED RESULTS:

The rapid delivery of flood inundation maps in emergency response situations will support federal government agencies, prime government contractors, first responders, and multilateral organizations that are involved in humanitarian relief and disaster recovery efforts in the immediate aftermath of major coastal and inland flooding events. This project will also proactively enhance community resilience planning, property risk assessment, water rights monitoring, and infrastructure investment activities by a range of other industries nationwide, including engineering, insurance, remote sensing, water utility, space systems, and agriculture.

FY 2020 PHASE I AWARD WINNER

FIRM:	Shellfish Solutions 91 Water Street Castine, ME 04421
AWARD:	$150,000.00
PHONE:	781-570-9406
E-MAIL:	chip@oystertracker.com
PRINCIPAL INVESTIGATOR (PI):	Wyllys Terry
TITLE OF PROJECT:	A Tide To Table Traceability and Marketing System for Shellfish Aquaculture
SUBTOPIC NUMBER:	9.1.01

TECHNICAL ABSTRACT:

In 2017 the CDC estimated 35,000 American got sick from Vibrio parahaemolyticus transmitted by shellfish--a 54% increase. However, according to the co-chair of the Interstate Shellfish Sanitation Commission, "Our current system of traceback is inadequate…. Records are lost. Handwriting is illegible. More than half of all traceback investigations fail because the information in the value chain is lost." Improvements in technology give us a unique opportunity to improve food safety.

Shellfish Solutions will leverage existing smart phones, QR codes, mobile thermal printers and cloud computing to build an inexpensive traceability system that will be lower cost to the existing handwritten tag system and significantly more powerful. We will improve shellfish safety while reducing the paperwork burden on farms.

To encourage adoption, farms will have the opportunity to market their product directly to dealers, chefs and consumers. Shellfish Solutions will embed videos, web pages and social media feeds into the QR code so anyone can learn more about the farm with their smartphone.

SUMMARY OF ANTICIPATED RESULTS:

The over 2,000 shellfish farms, thousands of dealers, and restaurants that dot every coastal state in the US are a boon for local communities, the environment, and consumers. An estimated 20% of the cost of farming and selling shellfish is related to regulatory compliance. Despite the time spent on compliance, over 50% of shellfish tracebacks fail because poor recordkeeping by someone in the supply chain. By making recordkeeping easier, we can improve food safety and make farms more profitable.
Beyond the initial sale, going digital sets the stage for future value-added solutions that will accelerate the growth of this industry.

FY 2020 PHASE I AWARD WINNER

FIRM: Skyward, Ltd.
                                       5717 Huberville Avenue, Suite 300
                                       Dayton, OH 45431

AWARD: $149,999.00

PHONE: 937-252-2710 x102

E-MAIL: dcyphers@skywardltd.com

PRINCIPAL INVESTIGATOR (PI):   Daniel Cyphers

TITLE OF PROJECT: Processing, Exploitation and Dissemination (PED) System for
                                       Rapid Response to Disasters

SUBTOPIC NUMBER: 9.4.01

TECHNICAL ABSTRACT:

First responders are more frequently using Small Unmanned Aerial Systems (sUAS) to aid rapid response to various types of natural disasters. Platforms, however; are typically focused on small, specific areas of interest and resulting data is rarely shared in real time. Decision makers may have no access to this data, nor access to broad area Common Operating Pictures (COP) fusing real-time sUAS data with layers of contextual information and products from supporting groups. Such practices are, however; common within the Department of Defense (DoD). Skyward seeks to transition these practices to the civil community.
During Phase I Skyward proposes to research the feasibility of developing enhancements to an existing sUAS-based Processing, Exploitation and Dissemination (PED) system based CONOPS which incorporates an sUAS platform, asset tracking technology, real-time sensors and geospatial data fusion and visualization environment. Phase I enhancements will focus on pulling products from supporting organizations for storage, visualization and sharing with the goal of rapid, enhanced broad area situational awareness for decision makers and first responders. This system, and the proposed enhancements, represent a revolutionary approach to civil disaster response Command and Control.

SUMMARY OF ANTICIPATED RESULTS:

The PED system based CONOPS is intended for use within multi-agency incident command centers as a means to provide broad-area real time situational awareness internally, and data sharing amongst partners unilaterally engaged in rapid disaster response. We see a booming commercial market as government agencies and industry services providers seek novel sUAS-based solutions to natural disasters which continue to increase in frequency and scope annually. Similar end-to-end PED solutions are developed for defense purposes and cost roughly 85% more than the Skyward solution. This system also strives to adhere to open source, open standards development for rapid expansion.

FY 2020 PHASE I AWARD WINNER

FIRM:	CVision AI, Inc. 81 West St Medford, MA 02155
AWARD:	$149,720.00
PHONE:	603-546-5246
E-MAIL:	benjamin.woodward@cvisional.com
PRINCIPAL INVESTIGATOR (PI):	Benjamin Woodward
TITLE OF PROJECT:	Automated Fillet Identification
SUBTOPIC NUMBER:	9.2.05

TECHNICAL ABSTRACT:

We propose to develop a fillet identification methodology using visible imagery that can be collected and processed on commodity hardware such as modern smartphones, dramatically increasing the availability of fillet identification technology. In order to accomplish this, we will gather an annotated data set of fillet pictures, traceable to verifiable whole fish images. Using these pictures, we will train an algorithm capable of identifying species from fillet images only, and efficient enough to run on a smartphone. We will further refine this algorithm to be calibrated to proper probabilistic output, including identifying when it is looking at either poor imagery, or a species it has not been trained on.

SUMMARY OF ANTICIPATED RESULTS:

Given the absence of a fast, low-cost, widely available solution to filet species identification and widespread fraud in the seafood marketplace, we believe the commercialization potential for an image-based algorithm is quite good. The end goal of this effort is a cell phone app that can rapidly identify raw fish fillets. This app would be available for use by individual consumers, seafood supply chain companies, and state and federal agencies. The use of this application will provide a wide variety of stakeholders the ability to detect seafood fraud in real time like has never been possible before.

FY 2020 PHASE I AWARD WINNER

FIRM:	INNOVIM LLC 6401 GOLDEN TRIANGLE DRIVE #200 Greenbelt, MD 20770
AWARD:	$91,520.00
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E-MAIL:	MMurphy@INNOVIM.COM
PRINCIPAL INVESTIGATOR (PI):	Marianna Murphy
TITLE OF PROJECT:	A NEW MACHINE LEARNING TECHNIQUE FOR ACCURATELY FORECASTING EXTREME PRECIPITATION FROM LANDFALLING ATMOSPHERIC RIVERS
SUBTOPIC NUMBER:	9.5.03

TECHNICAL ABSTRACT:

Atmospheric rivers transport large volumes of water vapor outside the tropics and when landfalling, produce large quantities of rain that replenish aquifers, contribute to beneficial increases in snowpack, yet can cause flooding and damage. Accurate forecasts of precipitation during landfalling atmospheric rivers are critical because they play a large role in water supply and flooding. However, the intensity, location, and duration of atmospheric rivers are poorly forecast in all currently operational numerical weather prediction models beyond forecast Day 7, resulting in a significant decision support services gap. We will employ machine learning techniques in developing a family of products that improve Earth system decision support models in general and the outlook for landfalling atmospheric rivers at 7-21 days in particular. Today's numerical weather prediction models produce skillful forecasts accurately predicting atmospheric rivers one week in advance, with rapidly diminished skill in Week 2. There exists additional information in the observing systems' datasets that are complementary to traditional weather forecasts and can significantly extends the accuracy and precision of the predictions—in terms of timing, location, intensity, and duration of landfalling atmospheric rivers—when these data are combined with deterministic or ensemble model predictions through the use of machine learning techniques.

SUMMARY OF ANTICIPATED RESULTS:

According to the NOAA, extreme weather cost $1.6 trillion between 1980 and 2018, while weather forecasts generate $35 billion in economic benefits to U.S. households annually. California alone suffers some $300 million a year in flood damage as a result of atmospheric river-derived precipitation. While it is difficult to precisely quantify the benefit to reservoir and emergency managers to be realized from even one additional day of skillful atmospheric river forecasts, it is significant—increased confidence in the forecasts would not only lead to increased lead time for more confident, earlier, and effective decision-making, but will drive strong commercial value.

FY 2020 PHASE I AWARD WINNER

FIRM: Cruyningen, Izak van (LineSpect)
                                        20830 Boyce Ln
                                        Saratoga, CA 95070

AWARD: $138,796.00

PHONE: 408-647-4751

E-MAIL: ikevc@linespect.com

PRINCIPAL INVESTIGATOR (PI):   Ike Van Cruyningen

TITLE OF PROJECT: Aircraft Detection 360 Camera and Microphone Array

SUBTOPIC NUMBER: 9.4.02

TECHNICAL ABSTRACT:

Unmanned aerial systems efficiently collect meteorological data for weather forecasting. Under Part 107 regulations, the FAA currently limits flights to 400 feet altitude but could grant a waiver if the applicant can demonstrate safe equipment and operations. By defining a protected area of operations, the applicant can switch the requirement from visually observing the UAV to detecting manned aircraft that enter this protected area of operations. The proposed embedded system with six cameras and a microphone array will match human visual and aural capabilities in detecting manned aircraft to 3200 meters. Building it from commercial off the shelf components keeps the mass to half a kilogram and the price reasonable. The detector will communicate aircraft range and bearing to the autopilot, and hence to the remote pilot in command for avoidance maneuvers.

SUMMARY OF ANTICIPATED RESULTS:

The proposed solution will be about one-third of the weight and cost of current radar solutions. It will find application in linear infrastructure industries such as utility lines, pipelines, roads, and railways; on large farms, mines, and construction projects; in scientific wildlife census, environmental monitoring, or remote sensing; and eventually in package delivery. Phase 2 will support the refinement of the software detection algorithms, design for manufacturing, and optimizing size, weight, and power.

FY 2020 PHASE I AWARD WINNER

FIRM:	Kraenion Labs LLC 17094 Lon Rd Los Gatos, CA 95033
AWARD:	$149,996.00
PHONE:	650-283-9142
E-MAIL:	binu@kraenion.com
PRINCIPAL INVESTIGATOR (PI):	Binu Mathew
TITLE OF PROJECT:	Machine Learning for Risk Assessment using Satellite and Aerial Imagery
SUBTOPIC NUMBER:	9.5.03

TECHNICAL ABSTRACT:

Kraenion is an AI company developing Machine Learning and Active Learning technology to analyze large 2D and 3D multi-spectral datasets of importance to public safety and national security. Our deep learning models and statistical vision algorithms process planet-scale satellite image datasets and security critical CT and X-ray imagery. Kraenion's Vision Engine platform includes active learning based neural network training technology where the training software is aware of the cost of labeling data. Unlike traditional neural network training that assumes a large labeled dataset, our system carefully picks samples that maximize the learning opportunity and presents it for labeling to a human annotator. This provides much higher return on dollars invested for data annotation in areas like satellite imagery where unlabeled data is abundant, but there is a scarcity of labeled data. In this SBIR, we propose a) Property risk assessment based on a combination of satellite/airborne imagery and ancillary GIS data such as maps of the electric grid and municipal building permits. b) Applications including coastal change analysis, land cover mapping and the annotation of weather data for Earth System Models.

SUMMARY OF ANTICIPATED RESULTS:

Our core product is a secure Computer Vision / Machine Learning platform for privacy / security sensitive 2D and 3D multi-spectral datasets including airborne and satellite imagery, X-rays and CT scans. We have two initial commercialization paths: a) A comprehensive underwriting-risk assessment product for the home insurance industry. b) An Active Learning and Machine Learning platform for federal agencies involved in Earth Science and satellite image analysis. The latter effort is funded by NASA and its commercialization path is to infuse the technology into federal customers including NASA, NOAA, NGA, USGS, USDA and DHS.