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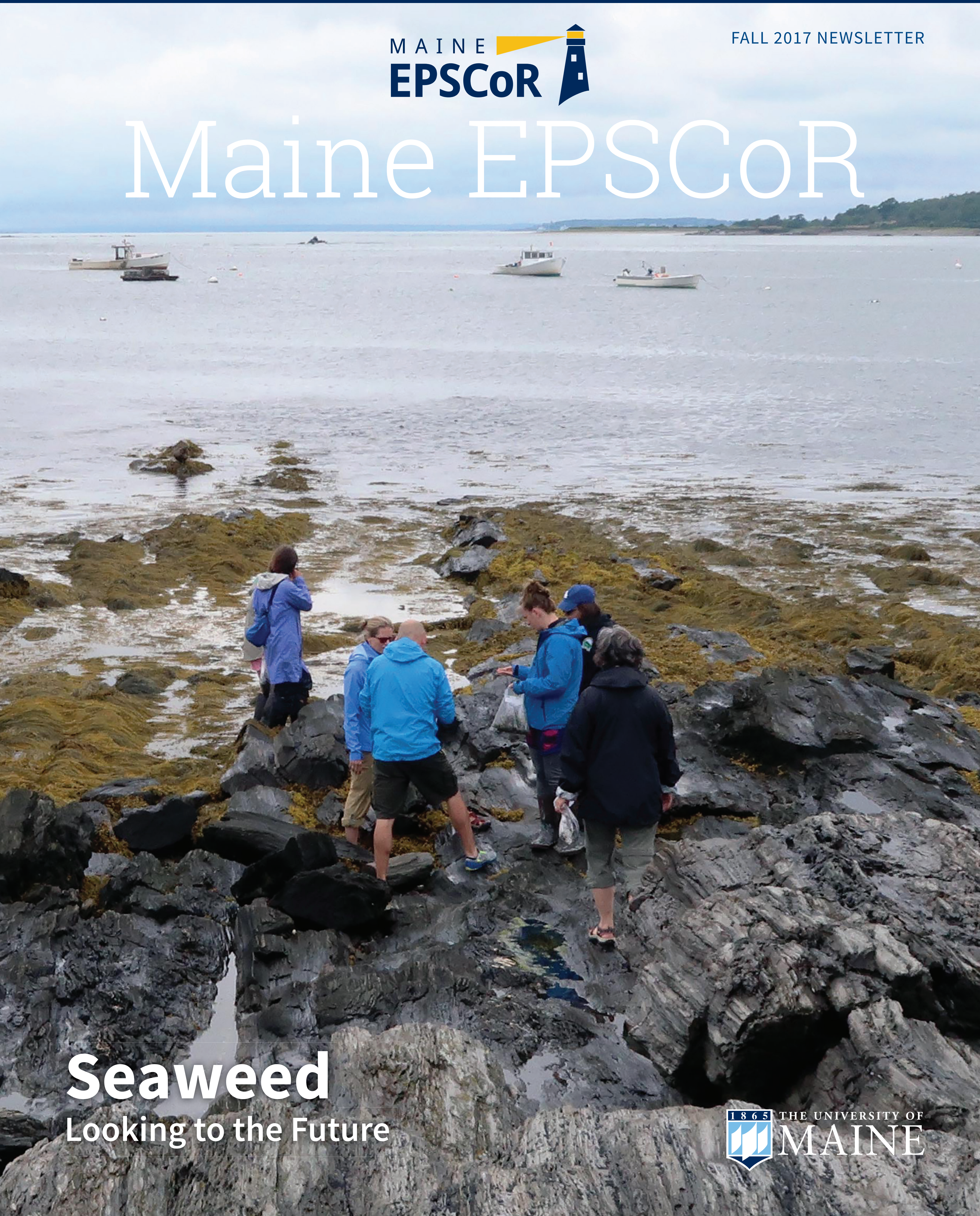
MAINE EPSCoR

FALL 2017 NEWSLETTER

Maine EPSCoR



Seaweed

Looking to the Future

THE UNIVERSITY OF MAINE 1865

From the director

NSF EPSCOR ADVANCES EXCELLENCE in science and engineering research and education in Maine. Two NSF EPSCoR grants are currently underway in our state, and I'd like to take this opportunity to highlight some of our recent achievements.

SEANET consists of 42 faculty members, 90 undergraduate students, 43 graduate students, and 3 Ph.D. candidates, who are engaged in aquaculture research at 11 institutions across the state. Recent accomplishments include:

- Successful National Science Foundation (NSF) site visit completed in August 2017, which reviewed the project against plans and objectives
- SEANET faculty and students have been highly productive, with 59 publications and 128 conference presentations reported in Year 3
- Follow-on grants totaling $7,691,243 awarded since the beginning of the grant in 2014

In addition to ongoing SEANET activities, the Maine state EPSCoR committee recently selected Environmental DNA (eDNA) as the research topic for our next Track I proposal. The University of Maine will be partnering with Bigelow Laboratory for Ocean Sciences as co-lead on the development of the grant. David Emerson, Senior Research Scientist at Bigelow, is serving as a technical lead and Kody Varahramyan, Vice President for Research and Dean of the Graduate School at UMaine, will be serving as PI.

We are currently in the initial stages of developing this grant and anticipate that it will be an active area of work for our team over the next nine months. We look forward to sharing news of our progress on this exciting endeavor as it becomes available.

In the meantime, it is with immense pleasure that I share our newsletter and invite you to read about recent advances in research and education. Your interest in our work is tremendously appreciated.

SHANE MOEYKENS
Director of Research Administration and Maine EPSCoR

A sunny afternoon at the Downeast Institute for Applied Marine Research & Education. The Institute, a longtime SEANET partner organization, seeks improve the quality of life for the people of downeast and coastal Maine through marine research, marine science education, and innovations in wild and cultured fisheries.

MAINE EPSCoR

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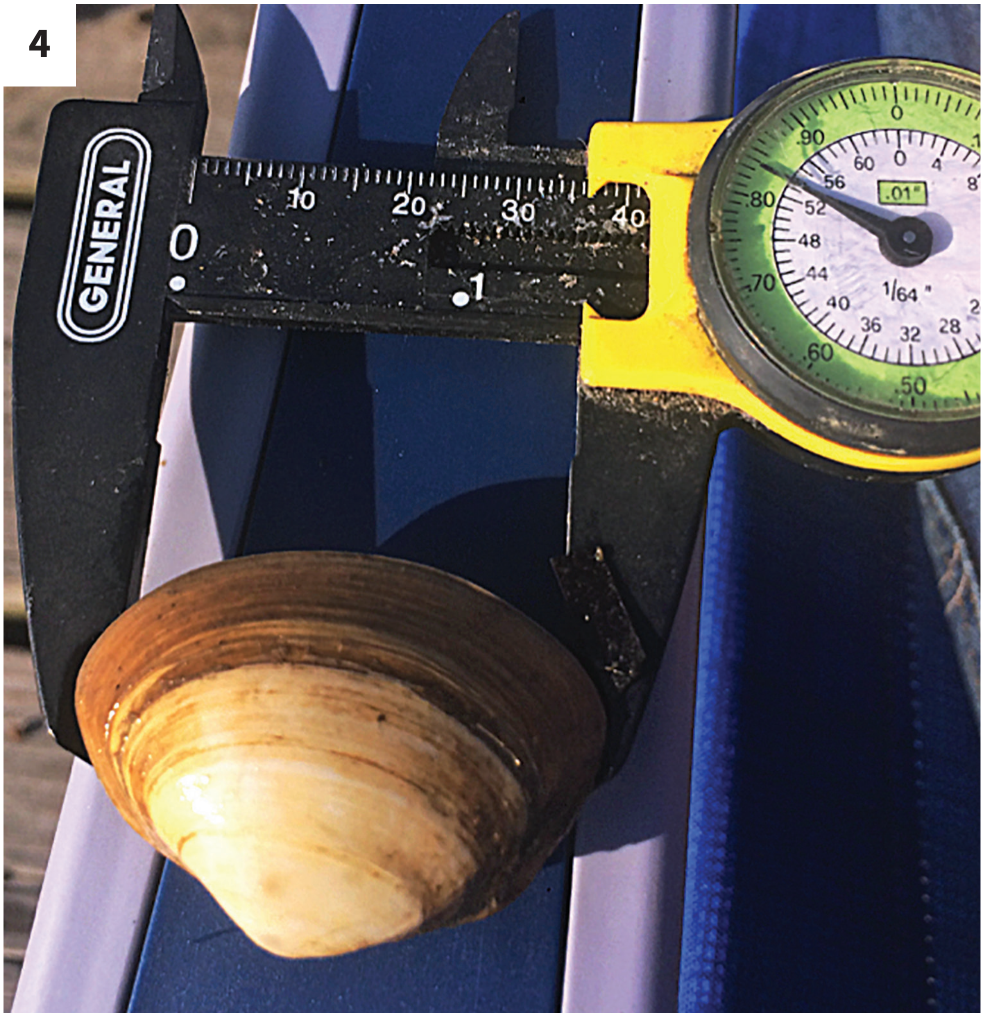

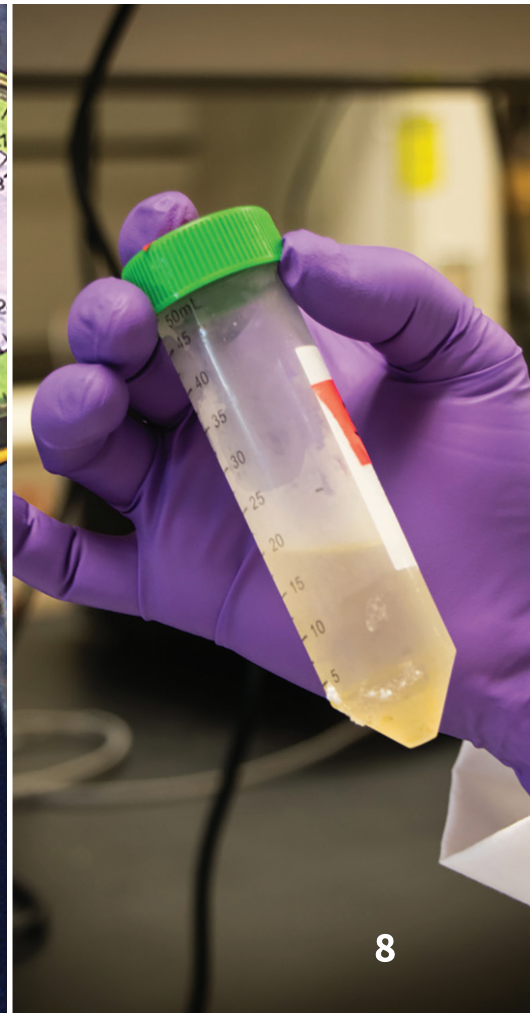

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What is Maine EPSCoR?

The Established Program to Stimulate Competitive Research (EPSCoR) was initiated at the National Science Foundation in 1978, and now encompasses EPSCoR programs at several other federal agencies.

Maine EPSCoR seeks to expand opportunities for more diverse faculty, staff and student populations throughout the state. Diversity brings different perspectives and skill sets, and helps broaden our vision. We recognize that geographic and societal challenges exist that require pragmatic solutions with achievable and measurable goals. Maine EPSCoR strives to enhance diversity in all elements of EPSCoR programs while increasing participation of underrepresented minorities in science, technology, engineering and mathematics (STEM) disciplines.

ON THE COVER:

These STEM teachers from across Maine are looking for wild harvest seaweed samples in southern Maine during the 2017 Seaweed Bootcamp. As part of this experience, teachers learned about how to seed and harvest seaweed in the wild and in nurseries, what nutritional benefits sea vegetables can provide, and how to include this new ingredient in traditional dishes. Read on for more about their sea to table experience in this issue.

Cover photo by Laurie Bragg

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Out of the Lab and Into the Field

Experiential Research at St. Joseph's College

BY CAITLIN YOUNG
Maine EPSCoR Student Writer

FOUNDED IN 1912, St. Joseph's College is a small, private liberal arts institution located on the shore of Sebago Lake in Standish, Maine. Dr. Mark Green, professor of Environmental and Marine Sciences in the Natural Sciences Department at St. Joseph's, has been conducting research in cooperation with SEANET since the program's inception. His students — all undergraduates — play an important role.

"Research science with undergrads is great," says Green, "because it's such an eye-opening experience for them, coming out of high school. They've been doing basic cookbook experiments in science labs, and then they come here. Suddenly, they're actually going out on boats, walking around in the mud, working with microscopes, tabulating data and analyzing results that mean something. It's a great experience. It gives them an appreciation of what real science is, and what real scientists do."

Working with Green, they've done a lot.

Green explores questions directly related to the growth of sustainable marine bivalve aquaculture in Maine. "My work has not been in what I'd call the 'pure science' realm of SEANET," he explains, instead categorizing his various projects as "applied research," dealing with problems and potential solutions that are "tangible to the general public."

One such project examines causes of mortality in hard-shell clams. In his previous research, Green discovered that low pH levels in the sediment of some mud flats caused the shells of juvenile clams to dissolve faster than they could form. Now, in partnership with Brian Beal (cooperating professor of Marine Ecology at the University of Maine's School of Marine Sciences, and Research Director at the Downeast Institute for Applied Marine Research and Education), Green and his students are investigating the relative effects of sediment pH and predation (primarily from ribbon worms and green crabs) on overall clam mortality. This summer, he and Beal deployed several predator exclusion devices known as Beal Boxes. To some of these, a CaCO3 limestone buffer was added, while others were left un-buffered. The results of predator exclusion, both with and without pH buffering, will be compared against external clam populations in the same mud flats.

"This experiment will allow us to tease out another mortality factor beyond simple predation," Green explains, "and we'll use the results generated this season to determine what the next questions will be."

Alongside this work, Green has been exploring the potential of a sea farming technique never before tested in Maine waters.

Sea scallops are one of the most popular seafood products, having ranked among the top ten seafood items consumed in the U.S. for decades. Despite the great success of scallop farming operations overseas, Maine scallops are exclusively wild-harvested. Supply cannot match consumer demand, with the result that scallops continue to be imported in tremendous quantities.

Photo by Mark Green

Domestically cultured scallops would provide consumers with a responsible alternative product. Scallops grown sustainably could likely be sold at a higher price than their wild-caught counterparts, further solidifying their potential value as a Maine product.

Hoping to address this deficit, Green has been experimenting with Atlantic sea scallops by making use of a Japanese culturing method known as "ear-hanging."

To grow scallops using this technique, a small hole is drilled in the hinge of each bivalve shell. Using something like a zip tie, the scallops are manually attached to a line, which is then hung vertically in the water. The lines are pulled up periodically for monitoring and maintenance. Scallops cultured in this way spend less of their energy swimming away from crabs, and this extra energy can be redirected into additional growth.

Though there were those who expressed doubts about the potential of Japanese ear-hanging to work in Maine, Green proceeded to hang his scallop lines off the coast of Basket Island in Biddeford. A year and a half later, Green says, "The scallops were just huge. Turns out, the technique works great. There's very low mortality, and very high growth rates — much higher than when scallops are grown in cages."

That isn't the only advantage ear-hanging has over using cages. Unlike other commonly cultured bivalves (such as oysters), scallops require space to move around. If grown in cages, at least half of each cage must be left empty. Cages are expensive, and one cage can't fit many scallops. On the other hand, ear-hanging makes it possible to "grow a tremendous number of scallops on a very small footprint," says Green. A hundred scallops can be successfully grown on a single line just beneath the water's surface.

The technique is not just effective — it is also environmentally sustainable. Wild-caught scallops are harvested primarily by dragging, widely considered one of the most destructive forms of fishing. Dragging, or "bottom trawling," involves pulling a fishing net through the water behind one or more boats. Weighed down by heavy gear, the nets cause large-scale destruction of the seabed — tearing up seaweeds, overturning boulders, damaging immobile organisms, and often resulting in significant bycatch. Domestically cultured scallops would provide consumers with a responsible alternative product. Scallops grown sustainably could likely be sold at a higher price than their wild-caught counterparts, further solidifying their potential value as a Maine product. At the same time, demand for scallops is so high that the establishment of such culturing operations would not threaten fishermen who continue to practice traditional wild-harvesting methods.

Green's ear-hanging experimentation is already yielding tangible results. While this is a proven method for scallop aquaculture in places like northeastern Japan, his success has inspired others to seriously pursue scallop farming here in Maine. "We can reduce our dependence on imports by increasing the local supply," he says, "Scallop farming has real potential to economically benefit the state."

Today, however, Green's core priority is another project altogether.

Atlantic surf clams — "those big clams with shells the size of salad plates" — are typically used as an ingredient in chowder, or cut up into strips and deep fried. Rarely are they considered a delicacy in their own right, but while a surf clam will take several years to grow to full size, Green explains, "they grow relatively fast to an inch, inch and a half — and they are actually delicious at that size." This summer, Green and his team have been looking at the Atlantic surf clam as an additional product that could be grown in Maine. A cold-water species, the clam does well in Maine waters.

Most important, says Green, "Virtually every species of burrowing bivalve depends on the three-dimensional pressure of the mud they live in surrounding them in order to form their ornate shells. Surf clams, however, grow just fine without that pressure matrix around them — at least for the first couple years of their lives. It appears that you can just keep them in bags sitting on the sea floor. This is huge, because it would allow farmers to grow them like we already grow oysters, essentially. And you can grow an inch and a half surf clam — which is a really nice cherrystone alternative — in about a year to a year and a half. An oyster takes three years."

Collaborating with SEANET has provided undergraduate research experience to his students and allowed them to "experiment with work that is going to help advance aquaculture in the state of Maine." Green's team has been measuring the growth rates of their surf clams, and experimenting with both surface and bottom grow-out systems. This month, they'll harvest and test the clams for toxins. Once clean, a distributer will bring them to local restaurants, where "we'll see how they're received," Green says.

Despite the surf clam's humble reputation, he's confident they will be a hit. "On menus, they're sold under the name 'butter clams,' which has a nice ring to it. Several years ago," he recalls, "I was goofing around with some surf clams, and a very famous chef down in New York City loved these things. I mean, he really loved them. To have somebody like that enthusiastic about a Maine product is a very positive thing."

Green intends to focus most of his energy on this project moving forward. "I think surf clams could easily be a major player in the aquaculture industry," he says. "They taste just as good as hard clams, you can grow them in bags, and they grow quickly.

"It's going to help produce local, sustainable seafood."

"Maine is primed for aquaculture," he concludes, "and educating the public about aquaculture in all its aspects, including how it could benefit the state economically, is critical. We need to spread that message. Maine is primed for it — now we just have to take those big steps forward." ■

Photo by Mark Green

Engineering a Future for Seaweed

Innovations in Food Science

BY MARCELLA CHEVIOT
Maine EPSCoR Staff Writer

SEAWEED (also known as sea vegetable) aquaculture is a rapidly expanding industry in Maine. Over the past several years, researchers have found an abundance of uses for sea vegetables, including chemistry, cuisine and medicine. Unfortunately, there has been limited use for sea vegetables as food or value-added food products and room for improvement regarding the process of preserving and storing sea vegetables as food. Luckily, SEANET researcher Dr. Balunkeswar Nayak has made great strides towards creating an efficient method for processing and preserving sea vegetables.

Nayak, an Assistant Professor of Food Processing at the University of Maine's School of Food and Agriculture, has extensive experience with food engineering for land-based agriculture products and is optimistic about improving the market for sea vegetable aquaculture in Maine.

"If I can apply my knowledge to a land-based agricultural food product, I can do it for a sea vegetable food product," Nayak says.

Over the past few years, he has done just that. Nayak (with his collaborators G. Peter van Walsum and John Belding) and his team of graduate researchers are now in Year 4 of their project, which is part of the Innovations Theme in SEANET. Together, they have identified some of the key issues of sea vegetable preservation and have used the knowledge to begin creating alternative methods.

According to Nayak, one of the initial challenges is figuring out exactly what sea vegetables in Maine are made of. Nutritional composition of sea vegetables has a lot to do with the water conditions in which they are grown. As the team conducts these initial studies, they are then able to hypothesize how the nutritional construct of Maine's sea vegetables varies from sea vegetables grown elsewhere and how that will be affected during the preservation process.

The next challenge in harvesting and storing sea vegetables has to do with quantity and time. "Once you

Clockwise: An infrared camera shows temperature distribution in the seaweed dryer during the drying process. The measurement of thermal properties of sugar kelp is done using a KD2 pro sensor in Dr. Balunkeswar Nayak's lab. Ash in vials during the quantification of the ash content in seaweed.

Photos by Marcella Cheviot

Analysis of the antioxidant capacity of post-processed seaweed using a colorimetric assay. *Photo by Marcella Cheviot*

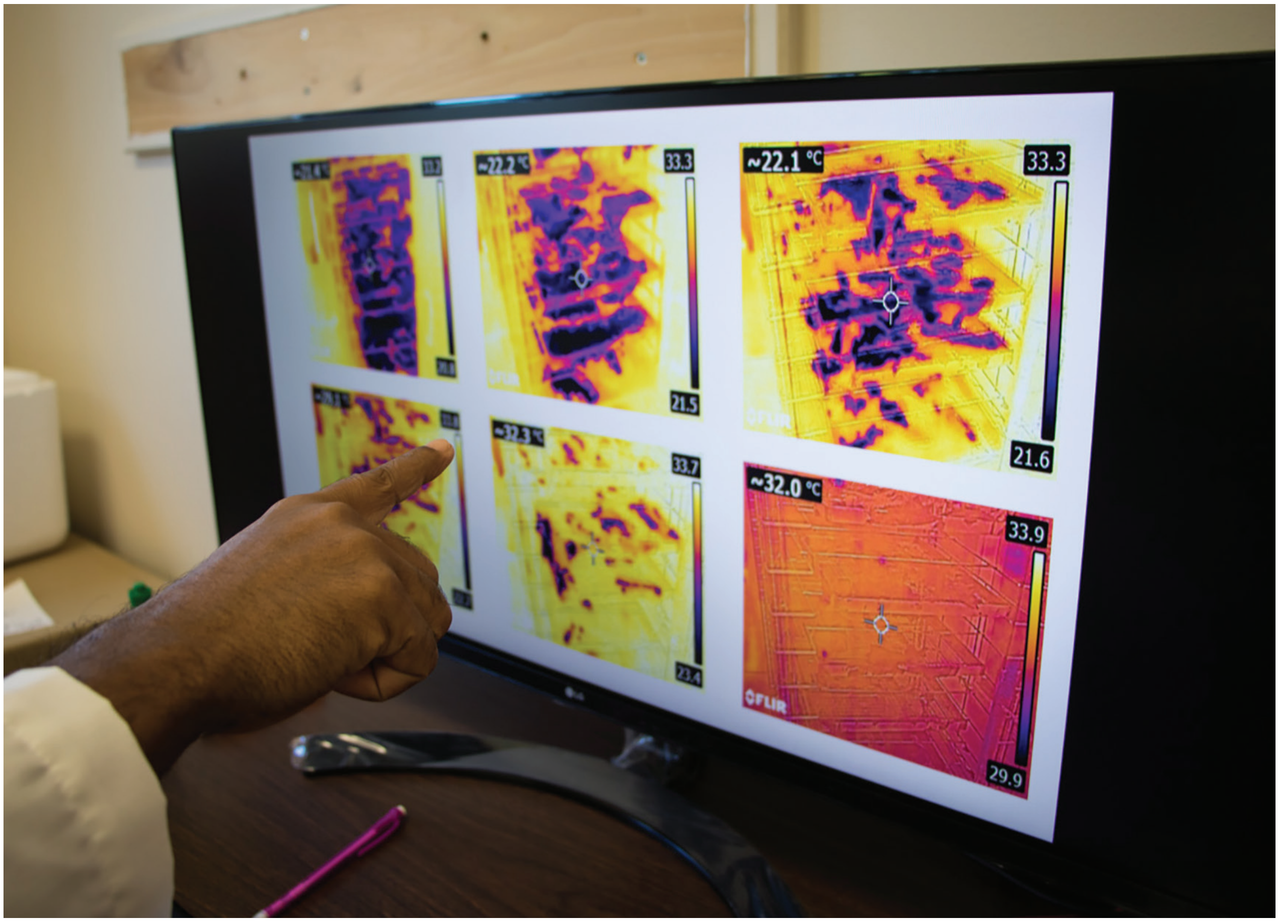
"Finding a drying method that can dry [sea-vegetables] in two to three hours is a huge undertaking. We cannot simply dry it at a very high temperature, because we still want it to be a high quality product rich in health benefiting bioactive antioxidant compounds."

Balunkeswar Nayak

have it, you cannot just store it and you cannot just consume it," Nayak says. While there are a few different practiced methods for preserving sea vegetables (i.e. drying and freezing) none of the methods are without flaws and farmers often find themselves very limited.

For example, a farmer may be able to dry their product outside on a sunny day, but weather can be unpredictable and varies from day to day. You may be able to dry the product in a garage, but it is uncertain how quality will be affected. You can freeze the product, but time is of the essence when delivering.

The main issue with each of these methods is that they can only work in small commodities. With Maine's growing sea vegetable market, farmers need something at a much larger scale so large quantities of sea vegetables can be



Dr. Balunkeswar Nayak and his graduate student, Praveen Sappati, analyze temperature distribution images to understand and design air flow conditions in the dryer. *Photo by Marcella Cheviot*

harvested, processed, preserved, and stored as quickly and efficiently as possible.

At the same time, Nayak and his team are concerned about maintaining the quality of the product, including taste and nutritional composition. In order to do this, studies have been done with a variety of variables, including temperature, duration and humidity.

"Finding a drying method that can dry [sea vegetables] in two to three hours is a huge undertaking. We cannot simply dry it at a very high temperature, because we still want it to be a high quality product rich in health benefiting bioactive antioxidant compounds," Nayak says. "We need to find a balance between the temperature, the duration of time, and then retaining those quality attributes in the final products."

Nayak's team has been hard at work creating models from their studies. The initial computer models influenced the creation of a working prototype that is located in the Advanced Manufacturing Center on the University of Maine campus. The prototype, a ventilated "dryer," is about the size of a walk-in freezer and has been used to test a variety of drying parameters. Temperature and airflow can be manipulated and measured using a variety of tools. These measurements are being used to influence future work.

Nayak is enthusiastic about the future of sea vegetable aquaculture in Maine. He believes that the product his team ends up creating could change the face of sea vegetable aquaculture and establish Maine at the forefront of innovation within the industry. ■

The Future of Maine's Working Waterfront:

A Look at the Link Between Aquaculture and the American Lobster

BY CAITLIN YOUNG
Maine EPSCoR Student Writer

AMALIA HARRINGTON is a doctoral student at the University of Maine's School of Marine Sciences. Currently in her second year as a SEANET researcher, her work focuses on understanding how changing environmental conditions in the Gulf of Maine will impact the state's aquaculture industry. Specifically, Harrington and her team are using the American lobster as a model organism to study the effects of rising temperatures on larval development and survival, as well as on behavioral patterns and gene expression. A second set of experiments will evaluate the influence of ocean acidification on lobsters in terms of overall health, stress levels and resilience.

"People sometimes ask me why my work is funded by SEANET, since lobsters are not a cultured species," says Harrington, "but our findings will have implications for key cultured species, such as oysters and bivalves. Also, the future of the lobster fishery is inextricably woven with the future of aquaculture in Maine, and any picture of local aquaculture that ignores this connection is incomplete."

The setup for her experiments begins with bringing egg-bearing female lobsters into the lab, where they are kept under optimal conditions to ensure successful hatching. When the larvae hatch, Harrington and her team disperse them evenly across four different temperature treatment categories. They monitor how long it takes the larvae to progress from one developmental stage to the next, as well as total survival. "One of the reasons we're working with lobsters instead of bivalves," explains Harrington, "is that lobsters have four distinct larval stages, and they're big enough that spotting the differences between them is relatively easy."

In addition to rates of survival and development, Harrington's team is particularly interested in the stress levels of their test subjects. The researchers draw hemolymph (a fluid equivalent to blood) from the larvae using a syringe to establish total hemocyte count. "Hemocytes are a type of cell that increases under stressful conditions," Harrington says, "and are therefore a good metric for determining the overall stress level of the animals." She and her team also perform whole RNA extraction to look for genetic processes related to stress that are either up- or down-regulated across the different temperature treatments. "Interestingly, we've found that total survival tends to increase with warming temperatures," she says. "However, hemocyte count is higher in the animals exposed to temperature extremes. This indicates that they are under greater stress, despite higher survival rates. We want to gain a deeper understanding of what's happening, and how this might impact their development further on."

"We're also looking at body morphometrics – how big their claws are, how big their bodies are. We're especially focused on the difference in size between the right and left claws. We're finding that the animals raised under warmer temperatures have a greater degree of asymmetry in the size of their claws than those kept in colder conditions." Harrington explains that this asymmetry could pose big challenges for the post-larval lobsters. "Having unequally sized claws hinders their swimming ability, and claw size

Photo by Holland Haverkamp


GRUNDÉNS
GRUNDÉNS

Photo by Marcella Cheviot

is important when they're fighting to establish territories." In addition to claw asymmetry, she says, "We're also seeing differences in the level of midline asymmetry. We may pursue this further by using histology to take a look at what's going on inside the animal, with organ development."

Finally, the team has plans to conduct behavioral analyses on some of the later-stage test subjects. One possibility under consideration is that rapid larval development may lead to changes in the habits of juvenile lobster. "It may be that asymmetry isn't such a big deal," Harrington says. "But if the Gulf is warming and they start settling earlier than usual — say, before the copepod bloom, which is what newly settled larvae primarily feed on – that's another host of problems. Acquiring enough food to sustain their metabolism could become extremely difficult, or impossible."

To examine the effects of ocean acidification, Harrington divides adult lobsters into two different pH treatments. The first establishes a control pH aligned with current environmental conditions, and the second maintains acidified conditions based on future projections for the Gulf of Maine. Both groups are left undisturbed for 65 days, at which point the team collects their biological data (including hemocyte count, and tissue samples for genetic analysis) for comparison.

"Then comes my favorite part of this experiment," Harrington says. "After the acidification process, we put about half those animals through a thermal challenge. I hook them up to a machine that measures heart rate, and place them in an arena. Then, I gradually ramp up the temperature from 12–29 degrees Celsius." During that time, she watches to see how their heart rate changes.

“What we’d expect, for all of these animals, is that increased temperatures correlate to elevated heart rates. But at a certain point, their heart rate becomes erratic, and actually starts to decrease with increasing temperature.” Harrington is trying to determine whether that critical point is different between the two test groups. “Last year, in a pilot study,” she says. “I found that the animals that had already been stressed by exposure to acidified conditions had lower thermal performance. They tolerated less fluctuation in temperature before their heart rate started to fall. Being exposed to one stressor appears to leave them physiologically compromised when trying to deal with another.” These findings are especially significant, she says, because, “In a changing global environment, nothing happens by itself.”

Collaborating with SEANET has been instrumental to Harrington’s research. Without their support, she says, “There’s no way this lab would be up and running. As a student, being part of SEANET — which unites all these different people, from different backgrounds — has really been beneficial. I have four faculty members from SEANET on my committee. The connections I’ve formed have helped me to think more broadly, and to put my work into perspective by ensuring that it’s relevant to what’s really going on environmentally.”

Harrington worked intensively with the Aquaculture Research Institute (ARI) and the Aquaculture Research Center on campus to build the ocean acidification (OA) system used in her experiments. Funded by SEANET, the OA lab provides critical investment in the field of aquaculture research. “From my perspective,” she says, “the OA system is one of the highlights of this project that will add a lot to SEANET infrastructure moving forward.” The system has been attracting significant attention, and other SEANET researchers have already used it for their own projects.

“We really tried to work out all the kinks as best we can so that someone else can just come in, follow our protocol, and get the system running,” she says. “It has huge potential.”

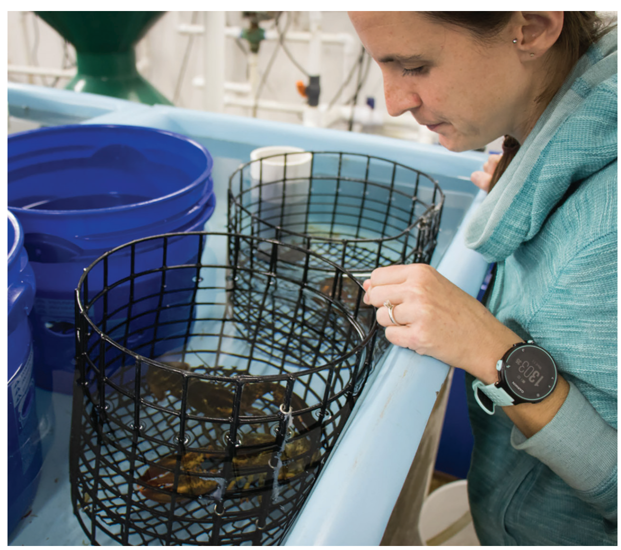
Harrington hopes that most of her data collection will be complete by the end of this academic year.

“Every time I give a presentation,” Harrington says, “I discuss the value of lobster to the state of Maine. Last year, landings from the lobster fishery brought in $533 million, not including the value of any related jobs or industries. Lobstering is a way of life here. Even if it’s only a fraction of what’s predicted to occur, the decline in future landings is not going to be easy to deal with.”

Through SEANET, Harrington is helping to establish how aquaculture can thrive in Maine and best ensure a bright future for the state’s working waterfront for years to come.

“People don’t want to think about change, but it is critical to consider,” she says. “Change is coming. This is a very resilient species, but it’s not going to perform the same way as a fishery in the future as it does now, or has in the past. Younger generations are investing a lot of money into lobstering, and the return on that investment in 20 years is not guaranteed. Many fishermen are very skeptical about putting in aquaculture leases. Realistically, our work is showing that they’re going to have to start diversifying.” ■

Amalia Harrington checks on the female lobsters regularly to keep track of their growth and behavioral patterns. Photo by Marcella Cheviot



Amalia Harrington keeps the lobster larvae separated in order to assure their safety and to make observation easier. Photo by Marcella Cheviot

Does it Taste Fishy? Can You Eat it Raw?

MOST OF THE DISCUSSION OF KELP AQUACULTURE seems to revolve around these questions, but not for Gretchen Grebe, a SEANET Graduate Student.

"Yeah, I actually eat a lot of kelp — the taste is quite pleasant and mild," says Grebe. "But what I'm really interested in is how kelp farms fit into the broader ecosystem around them and how they can potentially help to keep those ecosystems healthy."

Grebe partners with kelp farmers in Saco Bay, Casco Bay and Penobscot Bay to examine how factors like nutrients, water temperature, currents and myriad other variables impact kelp growth. Specifically, she is interested in how much nitrogen kelp farms take up and whether this natural process can be used as a way of maintaining high-quality water.

Nitrogen is essential for the growth of primary producers like plants and algae. In the right amounts, it is an incredibly good thing that allows an ecosystem to thrive. But just like too many cookies can lead to a stomach ache, too much nitrogen can be bad too. Runoff from impervious surfaces, landscaping and agriculture, and wastewater treatment often introduce large quantities of nitrogen into the marine environment. Surplus nitrogen in a coastal ecosystem can trigger excess growth of primary producers and result in phytoplankton blooms. These blooms, often making the water resemble a thick pea soup, are not healthy for the overall ecosystem and can lead to a decrease in light reaching sea grass beds, a decrease in oxygen on the sea floor, and a less than appetizing waterfront for humans.

Numerous studies have been conducted to evaluate the effectiveness of strategically growing macroalgae, like kelp, in areas receiving high nutrient inputs. This approach leverages the need that kelp have for nutrients like nitrogen and phosphorous in order to grow. When the nutrients are taken up by the kelp they are no longer available to other primary producers like the phytoplankton that produce nuisance blooms. When applied as a resource management practice, this is often referred to as bioremediation or bioextraction.

"I am interested in identifying opportunities where we can grow kelp purposefully to have both environmental benefits, through nutrient remediation, and economic gains for the farmers," says Grebe.

To do this, Grebe is trying to measure the amount of nitrogen that is assimilated by each farm over the course of the growing season. She compares these rates with other environmental factors to develop recommendations for how to increase nutrient uptake.

The Sustainable Ecological Aquaculture Network (SEANET) was built specifically to support this type of transdisciplinary approach to aquaculture research and development. The timing of the NSF award to Maine EPSCoR was particularly favorable for regional seaweed aquaculture development. The first kelp farms in Maine were started less than a decade ago. This means that we still know very little about how these farms interact with, and support, the larger ecosystems that host them.

Dr. Carrie Byron, SEANET faculty and advisor to Grebe, describes this scientific approach to studying the interactions between aquaculture and marine ecosystems using the term Ocean Food Systems Ecology.

"Ocean farms are so connected with their surrounding environment you really cannot look at them in isolation," says Byron. "By gaining a deeper understanding of those connections, we can work with aquaculture farmers to find that common ground where ecology and economy both benefit."

Byron's Laboratory at the University of New England focuses on this mantra of food webs supporting ocean foods with studies examining production of everything from kelp to mussels to finfish.

In addition to Grebe's work with kelp farms and nitrogen, other students in the Byron Lab are examining the services that these kelp farms might be offering to marine food webs. For example, Byron hypothesizes that a certain percentage of kelp may be carried away from the farm by waves and ultimately used as food by mussels and oysters in the region. Undergraduate and graduate students in Byron's lab are currently conducting research to test this hypothesis in Saco and Casco Bays.

"It's a really exciting time to be working in macroalgae aquaculture," remarks Grebe. "SEANET is providing the platform for researchers, non-profit organizations, schools, and industry members throughout the state to come together and explore the merits of kelp aquaculture".

For more information about the Byron Lab, visit blog.une.edu/byronlab. ■

Gretchen Grebe is a second-year Ph.D. student in the UMaine School of Marine Sciences. She works with the Ocean Food Systems Group at the Center for Excellence in Marine Science at the University of New England.

Dr. Leslie M. Smith is an Oceanographer, Science Communicator and the President of Your Ocean Consulting, LLC. Her company specializes in communication strategy development, website creation, technical and popular writing, geospatial analysis, and data management. Their goal is to help ocean scientists and programs tell their stories to local, national and international audiences. Smith received her Ph.D. from the University of Rhode Island Graduate School of Oceanography.

Kelp. More Than Just the Next Kale.

BY GRETCHEN GREBE AND LESLIE M. SMITH
University of New England • Photo by Adam St. Gelais

MAINE EPSCoR

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RETURN SERVICE REQUESTED

Seaweed Bootcamp 2017

THIS SUMMER, educators from throughout Maine and across the eastern seaboard joined aquaculture researchers and industry partners for a three-day seaweed boot camp hosted by Maine EPSCoR at the University of Maine, in partnership with Ocean's Balance and the Aquaculture Research Institute.

The workshop's innovative model was built to allow participants the opportunity to learn about ongoing research, curriculum development and the many ways in which seaweed can be incorporated into our lives, whether in the kitchen or in the classroom.

"We wanted all educators participating in this camp to gain a broad understanding of sea-to-table aquaculture and the vital role that seaweed can play in Maine's economic future," says Laurie Bragg, Maine EPSCoR program and outreach manager.

Over three days, participants visited researchers in their labs at UMaine, traveled to southern Maine to visit field sites with seaweed farmers, sampled seaweed products with producers, and learned cooking and preparation techniques with industry insiders.

Participants left the workshop with a better understanding of this burgeoning new industry and the tools with which to develop STEM curriculum around ongoing science and research.

Plans are being developed for a follow-up workshop and the experience is being leveraged in communities throughout the state.

"The seaweed boot camp was a big success," Bragg says. "As a result of the workshop, we now have an active network of teachers sharing curriculum ideas and implementing what they learned in classrooms from Old Orchard Beach to Machias. It's an exciting time for aquaculture education." ■

Educators from across Maine and New England participated in seaweed collection during the Summer 2017 Seaweed Bootcamp. Here they are pictured with Tollef Olsen of Ocean's Balance, after a morning of seaweed sample collecting in southern Maine.

UMAINE.EDU/EPSCOR

Maine State EPSCoR Committee:

Maine EPSCoR is overseen by the Maine Innovation Economy Advisory Board, a statewide steering committee of individuals from Maine's education, research, and business communities and state government. The board is under the auspices of Maine's Office of Innovation.

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