

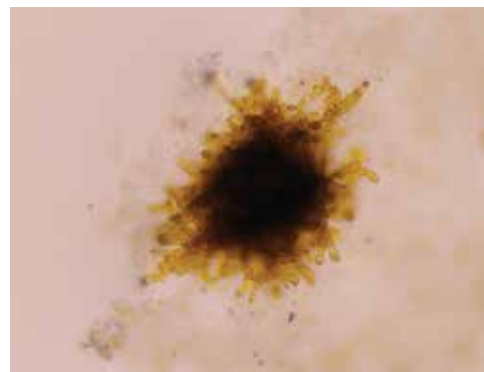
Editor's note: In April 2024, a mostly unfurnished 8-by-8-by-14-foot trailer arrived at the UConn Avery Point campus in Groton, basically a blank canvas that would soon be outfitted into a unique facility designed to nurture a fledgling aquaculture industry.

The mobile seaweed lab was purchased as part of a \$200,000 grant from the U.S. Department of Agriculture, and over the next several months outfitted with the equipment for growing sugar kelp, a seaweed native to New England, and for training seaweed farmers. Anoushka Concepcion, a former Connecticut Sea Grant extension educator who specialized in seaweed aquaculture, conceived of the project and led it in partnership with a Maine-based company, Spartan Sea Farms.

Clayton McGoldrick was hired as the seaweed lab technician, and by the winter of 2024 successfully grew his first crop of kelp in tanks in the lab from kelp reproductive sorus tissue he harvested from Long Island Sound. His is a one-of-a-kind job in a one-of-a-kind facility. Curious to know more?



Growing kelp on wheels: 10 questions with Clayton McGoldrick



Left: Clayton McGoldrick on the deck of the mobile seaweed lab. Photo: Judy Benson

Top: McGoldrick shows some of the young kelp growing on spools in the mobile seaweed lab this winter. Photo: Judy Benson

Bottom: Juvenile sporophyte of kelp, left, and a male gametophyte, both shown under a microscope. Photos: Clayton McGoldrick

1. Suppose you're at a party and meet someone for the first time who asks what you do for a living. How do you respond, assuming this person knows nothing about marine science and aquaculture?

"I really like this question, because when people first ask me about my job, it can be a challenge to find the best way to answer. I think what makes it so hard is that my role is centered around a specific aspect of an industry that is already very niche.

Overall, my role as the CT Sea Grant's mobile seaweed lab technician is focused on conducting industry-applicable research and producing educational resources to support the local seaweed farming industry, specifically in the nursery cultivation stage of sugar kelp. Here in Connecticut seaweed farmers are growing sugar kelp mainly as a nutritious local food product. The industry is currently exploring other potential applications for this versatile crop including use in cosmetics, soil amendments, biopolymers, snacks and many other possibilities.

For some people, just hearing that there is a seaweed farming industry here in Connecticut comes as a surprise. The U.S. seaweed farming industry is still emerging but gaining traction as interest grows in its sustainability, nutritional value, versatility and ecological benefits. As for what I actually do, I am currently operating the mobile seaweed lab as a small-scale kelp nursery to inform the development of educational resources and in-person training workshops. In addition, the research aspect of my job is focused on exploring cryopreservation (freezing) techniques for long-term storage of sugar kelp reproductive structures to alleviate farmers' reliance on wild stocks and seasonal availability of this material to begin their farming season."



2. Do you eat seaweed, and if so, how? Will the focus of the lab's work be on issues related to seaweed consumption, or on a broader array of potential uses?

"I do like to eat seaweed though I admit it is not a staple in my diet. Most often I eat seaweed in store-bought seaweed snacks but also use dried seaweed products such as pan-fried dulse in sandwiches, and kelp furikake (seasoning) on popcorn, rice and other foods to add salty-savory flavor. I really enjoy eating fresh kelp both right off the farm and added to macaroni and cheese, wrapped around seared scallops or in a relish. Availability of local kelp products is limited by seasonality. Shelf life is a bottleneck for industry. It is still considered a new crop in Connecticut and there is currently a lack of knowledge about how post-harvest processing may affect food safety standards. There are ongoing efforts in Connecticut to investigate these issues related to product development, but those do not currently involve the mobile lab. The focus of the mobile lab is now geared specifically to address issues related to kelp seed production and availability."

3. What kinds of skills are required for this job, and how did you obtain them?

"This job requires general handiness, basic lab technique, and understanding of aquaculture systems and maintenance, to name a few tangible skills. I am learning a lot as I go, because the mobile lab is brand new and there is no set standard to follow. That has been a fun challenge. My education, both attending the Bridgeport Regional Aquaculture Science and Technology Education Center (BRASTEC) and studying Marine Sciences at Stony Brook University, along with my background working on the water, has provided me with strong foundational knowledge that has enabled me to take on this role. I really enjoy working with my hands, which has played to my strengths in putting the lab together and learning how to operate it. Being efficient with using a

Kelp is grown on long lines during the winter months in Long Island Sound. Photo: Zach Gordon

microscope and able to roughly identify different microorganisms is a huge part of operating the lab as a nursery, and my background has prepared me well for that."

4. How old are you? What does it mean to you to have this unique job to potentially do groundbreaking work so early in your career?

"I am 24 years old, and this is my first job in my field since graduating college with a degree in marine science. It has been an awesome experience. I am beyond grateful to have the opportunity to do interesting work that supports local industry in Long Island Sound, where I fell in love with the ocean. I have been working with Connecticut Sea Grant (CTSG) for a bit over a year now and really feel like I've grown into my role. I have to thank all my colleagues at CTSG for allowing me this opportunity and supporting and inspiring me along the way."

5. Part of getting started growing kelp required diving in Long Island Sound. When did you dive, what was that experience like, and what was the outcome?

"My first experience with diving was taking an introduction to SCUBA course in college. For my current role I have obtained scientific diver certification and have been using SCUBA to collect "starter material" for kelp nursery cultivation.

When environmental conditions become optimal in the fall and spring, sugar kelp begins to develop reproductive tissue known as sorus. During this time, I planned dives with Zachary Gordon, the CTSG assistant extension educator focusing on seaweed, to search for kelp beds ripe with sorus. Once found, it is cut from the blade and collected, leaving the remainder of the plant intact. This past fall was the first nursery season for the mobile lab. It was super rewarding to track the when and where of sorus development and successfully dive to collect some for the mobile lab's first nursery season. Kelp is commonly found in rocky subtidal zones, and when diving for sorus we encounter many different

critters living amongst these habitats. Diving in Long Island Sound is typically at its best in fall and spring if you can bear the cold, because the cooler water temperatures promote excellent visibility.”

6. How will the seaweed lab be used?

“The lab is being used to test different approaches to small-scale kelp seed production to inform the development of educational resources. Currently, there are limited available resources for kelp nursery cultivation and many of them are outdated or most applicable to large-scale brick-and-mortar facilities. The size of the mobile lab’s kelp nursery system is designed to be more affordable and achievable for small farms. The nursery phase of kelp farming is short, lasting only four to eight weeks, so it is not practical for farmers to invest heavily in infrastructure and equipment for such a short-term need. As we refine our systems and techniques the lab will be taken “on the road” to host workshops in the Southern New England and New York area. The goal of the mobile lab is to increase kelp seed production by broadening access to in-person training workshops, and removing barriers such as cost and inconvenience of travel that limit the ability for people to participate in these valuable learning opportunities.”

7. What kinds of projects are on the horizon, and are you taking requests from industry, researchers, regulators and others? If so please explain.

“At this time, we are not taking requests from industry for future projects—we currently have our hands full with the seed string production project. But we are open to ideas for future research in the lab after this project ends in 2026. With the first nursery season behind us, we’re focusing on refining the lab’s nursery system, exploring ways to improve its functionality, and preparing for upcoming research. In the spring, when sorus tissue becomes available, we plan to begin cryopreservation research and continue kelp seed production. The development of educational resources and workshops will follow these efforts. The mobile lab was designed with a modular layout, allowing the interior to be adapted for future project needs.”

8. Describe what you had to do to get from a basically empty trailer space to a fully functioning lab.

“The mobile lab was built by OpBox, a Maine-based company that specializes in constructing modular, eco-friendly structures. It was delivered to meet regulations as a road-legal trailer, along with all the necessary electrical wiring to power the equipment inside of the lab. Inside, the lab came equipped with lab benches, a hand washing sink, a wire storage rack, and temperature control equipment but was ultimately a blank canvas ready to be transformed into a kelp nursery space. I spent a lot of time reading through existing manuals, researching products and talking with folks who have experience operating nurseries to make decisions on products and design. Accessibility was a priority when selecting materials, because we wanted to ensure that the system could be easily replicated.

The main aspects of the nursery system include a water filtration system, grow lighting, temperature control and culture tanks. Basic plumbing was used to configure the water filtration system to allow raw seawater to be pumped through a series of mechanical filtration and UV sterilization units before entering a holding tank. The culture system was built using the wire rack to house an LED grow light and culture tanks. Once the basic assembly of the lab was complete, we began testing the capability of the lab to create optimal culture conditions, making necessary tweaks before using the space for nursery cultivation this past fall.”



McGoldrick and Zach Gordon, CT Sea Grant assistant extension educator, dove in Long Island Sound to find kelp with reproductive sorus tissue to seed a new crop in the mobile lab. Photo: Clayton McGoldrick

9. What role do you hope the lab can play in developing the commercial seaweed industry?

“The lab has the potential to support the commercial seaweed industry by improving seed availability, refining kelp nursery techniques, and providing hands-on training opportunities. By creating resources that are accessible and user-friendly, we hope to make nursery operations more efficient and accessible to industry. As a mobile educational resource, the ability to bring the lab directly to farmers, researchers and coastal communities to provide training is a huge advancement in knowledge sharing. We hope this will help to demystify nursery operations, which have been considered too complex or difficult to replicate. As the industry continues to grow, the lab’s modular design will enable it to adapt to explore future research and innovation needs as they emerge.”

10. What are the experiences and interests throughout your life that have motivated you to want to work in this field?

“I have been fascinated by aquatic and marine life for as long as I can remember. Growing up in Connecticut, I spent much of my time exploring local ponds, tide pools and fishing. Fishing has been a constant in my life and as a young teen I turned that passion into a job, working on local charter fishing boats. Over the years I gained a deep understanding of the charter fishing industry and came to realize though I really enjoy doing it, it wasn’t what I wanted for a long-term career. A pivotal experience that motivated me to pursue a career in marine science came while attending the Bridgeport aquaculture school. My experiences there opened my eyes to potential career paths working on the water which ultimately led me to pursue a degree in marine sciences. After graduating college, I knew I wanted to find a career that allowed me to continue working on or with the water, while also contributing to a more sustainable future for coastal industries.”

