

# The Dream of Seaweed Farming Becomes Reality in Long Island Sound

by Peg Van Patten

Does your mental image of Long Island Sound include a seaweed farm that also cleans the surrounding water as the crop grows? Well, if not, it should! As part of a research project that he leads for Connecticut Sea Grant, Charles Yarish and his collaborators have successfully grown and harvested *Gracilaria*, an economically valuable edible seaweed, in the Sound. *Gracilaria* is a source of agar, an extract used as a nutrient and stabilizer in foods for humans and shrimp. It's also known as agar-agar, for growing cultures in labs. It's also used in salads and as a garnish.

The project is part of an effort involving seaweeds to bring a concept known as Integrated Multitrophic Aquaculture (IMTA) to our midst. That high-faluting name means simply, growing aquatic organisms at different levels in the food chain together, for their mutual benefit. In the process, bioremediation, or natural cleansing of the waters by certain living organisms, also happens.

Nitrogen-rich waste, produced by fish farming, dying plankton blooms, and human sources, acts like the nitrogen fertilizer that land farmers use for crops, supplying nutrition to the growing sea plants. As the seaweed (more appropriately termed "sea vegetable") takes up the nitrogen to grow healthy tissue, that nitrogen is removed from the waters, where, in excess, it becomes a pollutant.

Since beginning of the project in 2010, Yarish's team has worked with the Bridgeport Regional Aquaculture Science and Technology Education Center (BRATESTC). Students, staff, and faculty of this unique magnet high school

have been enthusiastic partners. Together, they have perfected growing this red seaweed in the laboratory, then in tanks, and finally transplanting it into Long Island Sound. They used various sized tanks, beginning with 20-liter jugs and finally scaling up to 4,000-liter tanks. Conditions such as light, temperature, and nutrients have to be just right for the marine plant to grow properly.

"We figured out how long it takes to grow *Gracilaria* and keep both in indoor culture and on long lines (ropes) outdoors," Yarish said. Using just one clone of the alga, the team can produce a mass culture in the laboratory, grow it in tanks, and then transplant it to the "field"—Long Island Sound—to mature. They harvested the first crop in the Fall of 2011.

The latest wrinkle in the seaweed-growing/water-cleansing effort is another pilot effort that Yarish is leading, with Sea Grant support—starting up a kelp farm in the waters near Bridgeport, adjacent to Fairfield, Connecticut. Sugar kelp, *Saccharina latissima*, extends through entire North Atlantic, from LIS to Canadian Arctic, all the way to Portugal in the Atlantic. It's consumed as a sea vegetable and also processed for its colloid material, alginate.

Sarah Redmond, a graduate student in Yarish's lab, generated a lot of excitement when she succeeded in defining the ideal conditions and developing the techniques to grow kelp through its entire life cycle. That opened the door for full-scale kelp farming, rather than the wild harvesting more traditionally done in New England and elsewhere.



A crew of students, industry partners, and interested others return ecstatic from planting the first kelp in Long Island Sound. Yarish is the tall man with mustache, furthest in back, upper right.



Preparing to deploy seed string on long lines to plant the first kelp farm in Long Island Sound.

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Sarah Redmond is a leader in the science and technology for cultivating kelp.

“Sarah Redmond, supported by Sea Grant, took the lead on the kelp work and has been instrumental in developing the techniques.” Yarish said. “She first came to me with the interest of becoming a seaweed farmer herself, and has dedicated herself to growing kelp in the laboratory.” Redmond recently accepted a position as Aquaculture Extension specialist with Maine Sea Grant, where she and Yarish have worked closely with a kelp-producing industry in Maine, Ocean Approved.

The technique is as simple as it is exciting. Mature kelp are induced to reproduce, then a tiny organism is cloned to produce a mass culture of seed stock. After 30 to 35 days, when the tiny juveniles on strings get to an easily visible size, the string is wound onto spools made from PVC pipe, then threaded like giant beads on a larger rope. The ropes are then taken via boat to the farm location.

“We have taken our spools of seed string and unraveled lengths and put them on long lines” explained Jang Kim, a postdoctoral technician in the Yarish lab who has overseen much of the *Gracilaria* effort. “The lines are suspended underwater at two different lengths, 1 and 2 meters down.” If all



A cylinder seeded with young kelp is threaded onto ropes for deployment.

goes well, there they will grow until maturity.

“With the unusually warm fall this year, we are a few weeks behind in the planting,” said Captain Ken Tober at BRASTECH, who developed the structure to the researchers’ expectations to keep the aquaculture system in place despite tides and inclement weather. “It was so successful that it withstood Hurricane Irene,” he said, “so we decided to go ahead and deploy through the winter.” The kelp is a cold-water species which actually grows at an amazing rate in the winter despite the harsh weather.

“We wouldn’t be able to accomplish our goals without the collaboration of BRASTECH in Bridgeport, Connecticut” said Yarish, a professor of Evolutionary Ecology and Biology at UConn.

“They have provided us with tanks and equipment not available at UConn in order to scale up the activities. They also provide a pilot field site, the only such site that exists in Connecticut, and boats.

The school is also involved in the education component of the research project, working with us on a manual and a DVD on how to grow both

*Gracilaria* and sugar kelp, which will be available from Sea Grant. Having helped develop this aquaculture technology, faculty are now incorporating it as well as new information on the biology into their curriculum.

“Our students are reading about seaweed biology and aquaculture, and learning about it, and this way they get to actually apply it and see the whole kelp life cycle in the field.” said Holly Turner, a teacher at BRASTECH. Then they can bring it back and harvest it, she said. “They like to get their hands into it, as they formulate questions and solve problems.”

The practical application of the aquaculture research holds potential benefits for industry, too, Yarish said. “We have developed that nursery technology and now we want to be the source of culture material; the go-to place for people who are interested in setting up nursery systems to grow seaweeds, in summer or winter.”

“We are working with several entrepreneurs, negotiating with business people. We are a resource for them and we are willing to work with them.” Yarish said. “Brendan Smith, owner of Thimble Island Oysters, for example, is interested in adding kelp to his farm. Bun Lai, a reknowned chef and owner of Miya’s Sushi restaurant in New Haven, is interested in adding seaweeds to his menus. These people are visionaries.”

“People have come to the school in Bridgeport and seen us all in action, and seeing is believing!” Yarish exclaimed. So, now does your image of a farm include seaweeds and the waters of Long Island Sound?

#### **About the Author:**

Peg Van Patten is communications director at Connecticut Sea Grant, at UConn. She edits *Wrack Lines* and adores Long Island Sound. She too was once a graduate student in Marine Sciences mentored by Professor Charles Yarish, studying the ecology and natural reproduction of kelp.