

Newtown Professor Pioneering Breakthroughs In Seaweed Science

If you thought that scientist talking about seaweed on a recent *CBS 60 Minutes* segment looked vaguely familiar, there's a good chance you have stood beside him or exchanged pleasantries while waiting in line at one of Newtown's grocery stores, pharmacies, or coffee counters.

And if you got him talking, like he did in a recent interview with *The Newtown Bee*, you would discover Charles Yarish's passion and excitement for what many people still regard as a slimy nuisance, is palpable.

"I've been in the seaweed business for a very long time," he said. "I was first introduced to seaweed back in 1969 when I was a student, and I took a class that changed my life. Little did I know that I would have some of the top experts in the world introduce me to the world of seaweed, which I've spent my career studying and looking at the ecological benefits of growing seaweed."

The affable PhD, experienced scuba diver, and promoter of all things seaweed is known around the world for his expertise, as evidenced by his curriculum vitae — which seems to be even longer than a healthy strand of his freshly farmed kelp.

Dr Yarish received his PhD from Rutgers University in 1976, and then immediately joined the faculty at the University of Connecticut, where he is in the Department of Ecology & Evolutionary Biology and the Department of Marine Sciences.

He has also been an adjunct professor of marine sciences at the State University of New York at Stony Brook; visiting scientist at the Biologische Anstalt Helgoland, Germany; a visiting professor of Marine Biology at the University of Groningen, The Netherlands; and most recently, a guest

professor at Shanghai Fisheries University, China.

Dr Yarish has served with many organizations, including the International Executive Service Corps' Aquacultural Project (Kenya); as a member of the organizing committee and the executive secretariat for the 5th International Phycological Congress, Qingdao, China; and on the Advisory Board of the Institute of BioSciences (Halifax); the National Research Council of Canada; and as a member of the RCN for the US National Science Foundation genome project on *Porphyra*.

In 1992, Prof Yarish received the Marinalg Award's First Prize at the XIVth International Seaweed Symposium in Brittany, France, for his work in East Africa (Kenya), judged to be the most useful to the economic development of the world seaweed industry.

He has also been a national lecturer, the elected secretary of the Phycological of America's Executive Committee, and its 2001 president. He has been an invited participant in many international invited symposia and meetings in Canada, Chile, Cuba, Germany, Ireland, Japan, People's Republic of China, Mexico, Portugal, South Africa, South Korea, Spain, The Netherlands, and the USA, which have dealt with the ecophysiology and biogeography of seaweeds.

At UConn, he developed an internationally known laboratory for seaweed R&D, and was intimately involved in the development of the global seaweed aquaculture industry, and in particular in the United States.

Bioextraction & IMTA

During his visit with The Newtown Bee, Dr Yarish said he is most interested in the development of integrated multi-trophic aquaculture (IMTA) and nutrient bioextraction systems where seaweeds are a key extractive component.

He has published extensively, edited several books — the most recent one published by Springer in 2014 titled *Long Island Sound: Prospects for the Urban Sea*.

And he has been a co-principal investigator of numerous grants awarded by the National, Connecticut, Maine, New Hampshire, and Massachusetts Sea Grant College Programs, The US Environmental Protection Agency, National Fish and Wildlife Foundation, BARD (US-Israel Binational Agriculture Research & Development Fund), as well as the States of Connecticut and New York.

In August 2007, Dr Yarish was the recipient of The 2007 Faculty Recognition Award, which recognizes sustained outstanding achievements in teaching, research, and services benefiting the University of Connecticut at Stamford, and a year later was elected to the Connecticut Academy of Science & Engineering.

In 2012, Prof Yarish received the University of Connecticut's Provost Award for Public Engagement and Outreach. In 2013, Prof Yarish and his coauthors received the Fernald Award for the best paper of the year published in *Rhodora*, and in 2014 received the speaker of the year award Connecticut Society of Cosmetic Chemists. In 2017, he and his colleagues published a well-received paper: "Seaweed aquaculture: cultivation technologies, challenges and its ecosystem services."

Settling in at his residence in Hawleyville, Dr Yarish does not dwell on any of these distinguished honors and opportunities, however. He is much happier talking about the seaweed he has helped develop, and that a growing number of aquaculture "farmers" from Maine to Connecticut's Thimble Islands are cultivating and selling to a growing number of retail locations.

His seaweed is also being served in restaurants and cafeterias across the country, including all of UConn's food service facilities, and to workers on the Google campus in California.

"If we take a look at the development of seaweed aquaculture, we need to look at Asia in particular, where they have so many people and not so much arable land," he explained. "When we look at the history of seaweed cultivation, especially in China with over 20 percent of the world's

population and less than five percent of the world's arable land."

Dr Yarish said it made sense for the Chinese to develop various cultivation techniques for growing seaweed, or sea greens as kelp is often referred to.

"Now the western countries are catching up," he said. "When we cultivate seaweeds, we don't have to use fresh water, we don't have to add fertilizers, and we're producing food that is quite good to eat and very healthy — and we're not going to have to spend all the resources we devote to terrestrial agriculture. We're going to be growing it in the sea, either near shore or off shore."

3D Aquaculture

When addressing the complex-sounding concept of integrated multi-trophic aquaculture or IMTA, Dr Yarish simplifies it by saying the practice creates situations where two or more types of food producing entities complement and help sustain each other.

"It's like salmon farming," he said. "It behooves a salmon farmer to grow seaweeds and shellfish along with the salmon because they are going to be extracting the nutrients the salmon are releasing [as waste] in the water. So IMTA is just a farming technique."

Dr Yarish and his colleagues refer to the growing system as "3D Aquaculture."

"We're using the entire water column for growing the shellfish and the seaweed," he said.

With the growing popularity of seaweed as a food source, Dr Yarish said a number of his associates right here in Connecticut and New England are finding career-saving opportunities as commercial fishing has become so much more challenging, dangerous, and costly for smaller owner-operators who may just have a single boat.

"I'm particularly interested in the working waterfront. And when we look

at our New England waterfront, we're seeing our wild caught fisheries diminishing, and our lobster populations are diminished," he said. "So when we look at growing certain types of seaweeds that are edible or can be used for other purposes, we can bring these jobs back."

Dr Yarish said these jobs based in coastal waters around the United States, which are well regulated by numerous government agencies. As a result, those receiving permission to grow seaweed are subject to a significant amount of scrutiny.

"This is good for the consumer because they are consuming something from waters they know something about, and where there are good regulations," he said. "And the idea of keeping these jobs in New England is so important, especially in the marine area."

Reciprocal Benefits

Seaweed also gives back by making the water in which it is grown healthier.

"It's taking carbon dioxide out of the water, and as it's taking carbon dioxide from the water, it's taking it from the air as well. That means we have an opportunity to mitigate ocean acidification, and problems with too much CO₂ in the environment," he said. "That's going to be important for species that produce shells — oysters, muscles, and clams, which because of ocean acidification, limits their shell production."

With Connecticut being a world leader in oyster production, this is good news locally.

One of the other great things about kelp farming is that it creates minimal competition for water surface that is used for recreational purposes. That, as Dr Yarish explains, is because seaweed is grown and farmed off season, when recreational users and damaging weather phenomenon like hurricanes pose little or no interference.

"It grows delightfully well in the dead of winter, and by May when

recreational boaters come around, they are harvesting their seaweed products — which is when it is taking up carbon dioxide and changing the PH of coastal waters, and that can be important for the shellfish,” Dr Yarish said.

The switch from fish hunter to sea farmer is a conversion that is beginning to happen more frequently — and willingly, according to the professor.

“Our ocean farmer who we brought into our program, Bren Smith, developed an organization called [GreenWave](#) because he felt it was important to have an extension of our laboratory showing other potential farmers how to do what he is doing,” he said.

“We taught him, he started teaching others, and they are out there providing seed and giving others an opportunity to develop their own income,” Dr Yarish added. “In Long Island Sound alone now we have nine or ten kelp farms, in part, working from the technologies we’ve developed and made open sourced at the University of Connecticut.”

Learn more about Bren Smith and GreenWave here: