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Maine scallop farmers get the hang of Japanese technique

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By James Wright

Technology sharing traces back to 'sister state' relationship forged in 1993

Sea scallops pose several critical challenges to commercial shellfish farmers that other popular bivalve species do not. Unlike oysters, clams and mussels, scallops require containment to not only ward off predators but to prevent them from – believe it or not – swimming away.

Furthermore, the typical submersible cages or mesh bags that oyster farmers employ will work for scallops, but the animals don't thrive when packed tight like oysters. Simply put, scallops like their personal space and will flee to find it if necessary.

Mark Green, a professor of natural sciences at St. Joseph's College in Maine and co-owner of Basket Island Oyster Co., which operates in the southern part of the state, had previously toyed with farming scallops as well, growing them in bottom cages. It worked well, he said, but not like for oysters, which can tolerate "shoulder to shoulder" stocking densities.

"I was like, 'Forget this, man.' Why grow a sea scallop when you can grow 10 times as many oysters in the same area," Green told the *Advocate*. "Then I tried ear-hanging."



Holes drilled into the “ears” of sea scallops allow the animals to be hung on ropes and submerged in the water column for optimum growth. Photo courtesy of Dana Morse.

From Japan ...

Ear-hanging sea scallops (*Placopecten magellanicus*) is a technique developed in Japan, in which a hole is drilled in the “ear” of the scallop shell – one of two flat corners of the shell near the hinge – so that it can be tied to a submerged line for grow-out. Japanese scallop aquaculture is considered to be one of the oldest and most successful organized efforts in the world, with spat (larvae) collection dating back to the 1930s.

The scallops that are hung on these lines are spaced several inches apart from each other, which allows them to grow much faster as they are exposed to a free-flowing atmosphere in which to filter water and feed on phytoplankton, for up to two years until harvest.

“It grows phenomenally well, probably twice as fast,” said Green, adding that ear-hanging solves a few issues while introducing others. “It’s very labor intensive, to be drilling holes by hand. When you pay people to do that, it’s costing you a lot to grow a scallop.”

Enter Hugh Cowperthwaite, director of fisheries projects for Coastal Enterprises Inc. (CEI), a community development and business counseling organization based primarily in Maine. Cowperthwaite has been seeking ways to keep Maine fishing families tied to the seafood industry despite major restrictions on commercial fishing efforts throughout the Northeast United States that have put many of them out of work. Maine’s cold waters and largely rural landscape are ideal for many types of aquaculture, and CEI helps fishermen transition to farming.

CEI is taking advantage of a “sister state” agreement that was originally formed in 1993 between the shipbuilding town of Bath, Maine, and Shariki, Japan. The partnership quickly expanded to include the entire state of Maine and Aomori Prefecture in northern Japan, through a group called Friends of Aomori. The relationship includes biannual delegations that facilitate and encourage educational, cultural and business trade relations.



A look at the submerged lines used in the ear-hanging technique for growing sea scallops, developed in Japan and being adopted in Maine.

Cowperthwaite said that in 1999 a delegation from Maine went to look at Japan’s scallop industry. The collection of wild scallop spat had been an emphasis for Maine since the 1980s, but primarily to repopulate wild stocks. The visit to Japan “planted a seed” in exposing Maine to a farming industry.

In October, Cowperthwaite will lead another delegation to Japan, along with a handful of scallop farmers that have secured permits to grow in Maine waters, to bring back more knowledge and technology developed in Japan. They’re also going with a Maine Technology Institute cluster grant worth \$134,189 to buy three pieces of equipment that should allow for scalable, profitable production of farmed scallops.

“I don’t think we’d be where we are without that relationship,” said Cowperthwaite. “We’d been chugging along since 1995, but hadn’t taken that next step of setting up a farm in Maine focusing on scallops. If we get a few farms going, and can prove the concept, others will see it as an economic opportunity, much like the oyster and mussel industries.”

Of the 110 standard aquaculture lease holders in Maine, 28 are permitted to grow scallops but only a handful of them do.

... to Maine

The cluster grant funds will be used primarily to test the efficiency of automated equipment: one piece that will make the **vertical lines with plastic pins** (https://www.youtube.com/watch?v=T8gsrpL_hRk) for hanging the scallops, another for **drilling the holes** (<https://www.youtube.com/watch?v=vObMm09twGY>) in the scallop shells. The third piece is for **cleaning the biofouling** (<https://www.youtube.com/watch?v=PEFwBPsX000>) off the scallops – it's mounted on the side of a boat – once they've been in a growing position for five or six months. The “washing machine,” as Green calls it, could be the difference maker.

“They're these furry beasts, mossy globs, when you pull them out of the water,” said Green. “I imagine growth rates will be even higher than what we've documented when we start washing them.” Green's business partner in his scallop-farming venture, Maine Scallop Co., said the machines will drastically reduce labor costs. “It's the equivalent of going from tilling soil by hand to tilling soil with a tractor,” said Peter Stocks.



Without automation, using specialized equipment developed in Japan, scallop farmers using the ear-hanging technique have to drill the oysters individually, by hand.

“It's totally mobile. The boat goes to a lease site on the water, the vessel pulls up the grow-out lines, pulls the line over the top of a wheel and the scallops go through a short conveyor belt,” explained Cowperthwaite. “The scallops lay flat and are blasted with sea water, top and bottom, sort of like a car wash. Then the lines are deployed back in the water. All in a matter of seconds.”

Dana Morse, extension associate for Maine Sea Grant College Program and the University of Maine Cooperative Extension in Walpole, Maine, has been working on scallop restocking and farming efforts for 17 years at the Darling Marine Center. For the past five years, the efforts have turned mostly to farming and Morse has “done a lot with a little,” experimenting with different kinds of culture gear, while collecting data on growth rates and mortality. He'll be traveling to Japan as well and hopes to project some economic analysis for scallop farming in Maine waters, looking at production costs and benefits like meat yield and market value.

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Morse added that the market for scallops is strong, particularly for live scallops, where the adductor muscle – the main chunk of meat – remains in the shell with the orange-colored “coral,” or roe sack, which is prized by chefs.

Scallops pose one last and significant challenge, as only the adductor muscle does not sequester toxins from the water, as would be present in a “red tide” algal bloom. All scallops landed by Maine fishermen must be shucked on board the boat, with only the adductor meat reaching the market, to prevent instances of paralytic shellfish poisoning, or PSP.

“We’ve worked closely with [Maine Department of Marine Resources] to come up with a system by which growers can be allowed to sell live product. To do that requires testing, which is fairly expensive and rigorous,” said Morse. “It limits the profitability of the live market right now as the testing costs are high.”



Dana Morse (left) and Hugh Cowperthwaite affix sea scallops to a submersible line, using the Japanese ear-hanging technique. The work they’re doing by hand will be far more efficient with equipment invented in Japan. Photo courtesy of CEI.

Sebastian Belle (<https://www.aquaculturealliance.org/advocate/aquaculture-exchange-sebastian-belle/>), executive director of the Maine Aquaculture Association, told the *Advocate* that he’s excited about the potential of farming scallops, a native species, in Maine waters. Scallops could offer established shellfish farmers the opportunity to diversify.

“I have no doubt in my mind that we could have a good, healthy scallop aquaculture sector in Maine,” he said. “There are some challenges to be solved, and [the upcoming delegation to Japan] will focus on one of them, which is increasing mechanism and efficiency. We also need to find solutions to the PSP challenge. But the big wild card is how does a farmed product stack up against a wild product? The only way is to start doing it.”

Through this scallop venture, the farmers, the funders, the researchers and state regulators are all demonstrating the power of collaboration. Cowperthwaite said the state has provided funds for further trials with ear-hanging across the state.

“Collectively, we’ll see if this is an option for Maine,” he said. “You have to have the mechanisms, the volume and reduce the labor costs to prove this out. It’s a bit of an experiment. But everyone involved sees the promise.”

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