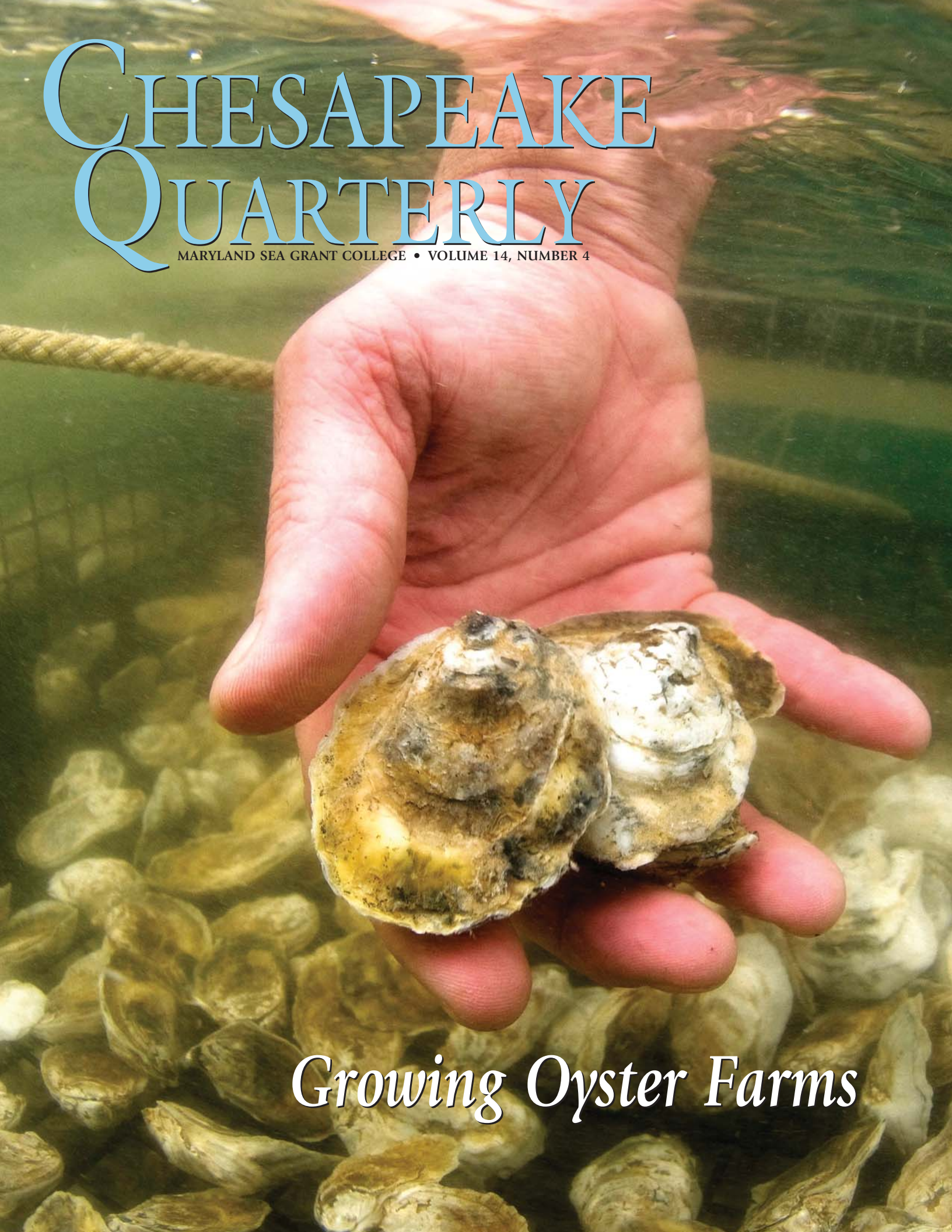

Chesapeake Quarterly

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Growing Oyster Farms

contents

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Cover photo: *A worker with the Hooper Island Oyster Aquaculture Company checks on an oyster held during its growout phase in an underwater cage. The state of Maryland has been giving oyster aquaculture a hand up, hoping to create new businesses and new jobs in the state's Tidewater region.* ***Page 3:*** *Workers at the aquaculture company haul a double-stack cage holding two racks of oysters aboard a workboat.* PHOTOGRAPHS: JAY FLEMING

KICK-STARTING THE FUTURE

Oyster Farming Moves into Maryland Waters

Michael W. Fincham

Oyster aquaculture in Maryland has changed more in the past decade than it has in the past two centuries. Aquaculture, like agriculture, is a form of farming, but farming oysters requires space not on the land but along the bottom of the Chesapeake Bay — and that space, until recently, was hard to come by in Maryland. In 1820, the state legislature passed a law that first allowed a citizen to set up private one-acre farm plots for growing oysters on the Bay's bottom. Good luck building a business on a one-acre farm.

During the 19th and 20th centuries, oyster farming businesses were not welcome in most of Maryland's Bay waters. Any stretch of Bay bottom that held oysters was protected as public oyster grounds and reserved for commercial fishing rather than private farming. Watermen could harvest the bottom with dredges, hand tongs, patent tongs, and scuba outfits. Would-be oyster growers who wanted to stake out a piece of Bay or river bottom for growing oysters faced restrictive state laws that limited the size and number of private leases. Corporations were not allowed to lease at all.

That history reached a turning point in 2009 when the Maryland General Assembly passed legislation that swept away some of those long-standing restrictions limiting the size and number of private leases. The state then reduced the size of the public oyster grounds, put 24 percent of the remaining quality grounds into off-limit oyster sanctuaries, and opened up tens of thousands of acres to private farmers who wanted to grow oysters — either along the bottom of the Bay or in cages or bags or floats in the water column.

Those breakthroughs were followed by others. In the following years state agencies set up a variety of programs designed to fire up oyster farming in Maryland waters. To help new growers with start-up costs, the state set up new low-cost loan programs. The hatchery at the University of Maryland Horn Point Laboratory increased its production of oyster larvae and made more of it available to private farmers. Marine Extension specialists with Maryland Sea Grant worked with the Oyster Recovery Partnership, a nonprofit organization, to organize new training sessions that taught would-be farmers how to apply for a loan, how to prepare a lease site if they were using bottom culture, and how to

create their own seed oysters by using hatchery-spawned larvae and remote setting tanks. The state of Maryland — after witnessing decades of declines in oyster fishing — was now making a bet on the future of oyster farming.

The goal laid out by then-Governor Martin O'Malley was to create a shellfish aquaculture industry that could help the ecology of the Bay and the economy of the state's Tidewater regions. Growing more oysters around the Bay would put more filter feeders into an ecosystem oversaturated with nutrients, algae, and plankton. The state's economic target was an industry that would be worth more than $25 million annually. The industry would support more than 150 businesses and create the full-time equivalent of 225 jobs, counting full-time, part-time, and seasonal work.

The results to date bode well for hitting those economic targets. As of October 2015, more than 150 businesses were active, many of them one-person operations. More than 498 workers held licenses to harvest oysters on 350 active leases spread over more than 4,500 acres. Those numbers will keep changing as new lease applications move through the approval process, says Karl Roscher, aquaculture chief for the Maryland Department of Natural Resources.

The industry that's emerged is divided into two distinct camps: those who grow oysters on the bottom and those who grow them off the bottom in cages, bags, or floats. More than 80 percent of the current leases, both new and long-standing, are labeled as bottom leases, and they occupy more than 90 percent of the acres under lease. The largest of these leases is 311 acres and the average size is 14.5 acres — a far cry from those early one-acre leases.

Bottom farming falls into two subcamps: operations that spread loose shell on the bottom and rely on natural spat set, and those that plant seed oysters — shells that come with spat, or baby oysters, already attached. The oysters on both kinds of bottom leases typically take three years to reach market size, and when they are harvested they arrive on the boat clumped together. They are usually shucked and canned, ending up breaded and fried or cooked in a classic oyster stew.

Since 2010, however, nearly half the new leases are labeled as water-column leases, and they have gone to growers who are trying a variety of off-bottom techniques. These farmers start with hatchery-spawned larvae that is set not on shucked shell, but on tiny chips of shell, producing single, unclumped oysters, called cultchless oysters. Most of these farmers use floats or cages (considered water-column devices, even though they sit on the bottom). Some farmers also use bags for part of the growout stage. As a result these farmers use less acreage, averaging 4.2 acres per lease, but they have to put in more hand labor with multiple haul outs of their floats and cages for tumbling and grading and splitting the loads into more cages. The oysters they harvest will usually end up in restaurants or raw bars served as oysters on the half shell, dressed with cocktail sauce or a classic tangy, red-wine mignonette sauce.

Where are most of the farms? In St. Mary's County in Southern Maryland along the creeks and shores of the lower Patuxent and Potomac Rivers. And in Dorchester County on the Eastern Shore, along waterways like the Choptank and the Honga. They are the busiest centers for oyster farming, especially for off-bottom oyster farming. More than 65 percent of water-column leases are located in these two counties.

The waters of Talbot, Wicomico, Somerset, and Anne Arundel Counties, on the other hand, have very few water-column leases but dozens of bottom leases.

Where is the money coming from for all the start-up loans for all those farms? From the federal government and from the state of Maryland — and from some creative collaborations among some unusual loan makers. Some of the money now targeted for helping oyster farmers was originally set aside to help blue crab fishermen back when the harvest crash of

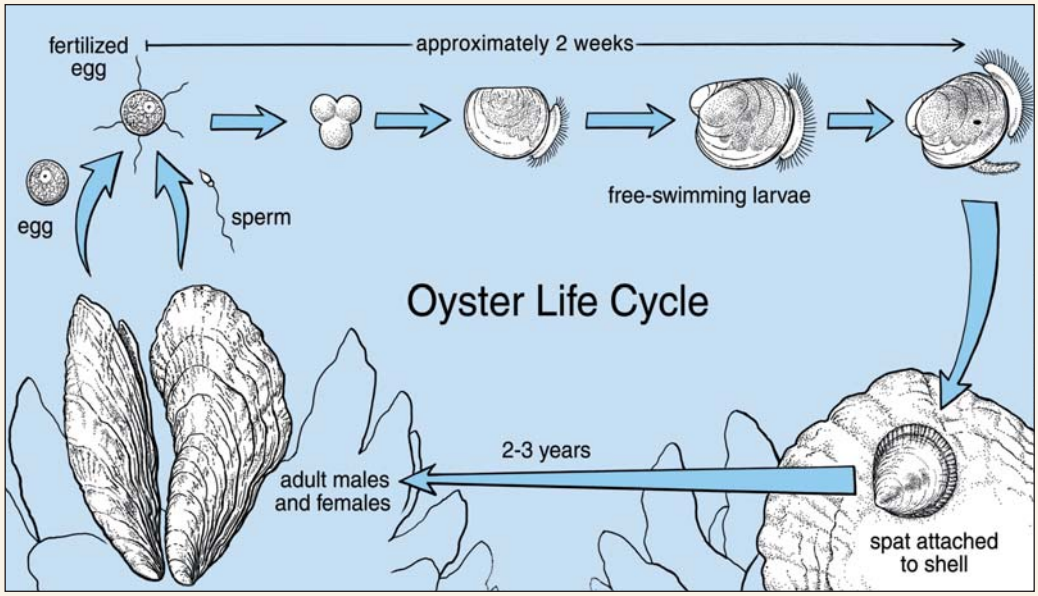
Oyster Farming: Some Terms

Oyster scientists and watermen and farmers throw around a lot of terms they find familiar and the rest of us find odd. When we order oysters on the half-shell, we don't spend much time thinking about cultch and larvae, seed oysters and spat set, diploids and triploids. But the people who grow oysters for a living spend a lot of time thinking about these terms.

Spawning erupts when male and female oysters release sperm and eggs into the water where sperm can fertilize eggs and create larvae which float and feed before becoming spat.

Larvae are the free-swimming organisms created by spawning.

Spat set results when free-swimming planktonic larvae undergo metamorphosis and settle on to some kind of hard substrate, usually an oyster shell. Once they set and stick they become baby oysters and are called spat.



© John Norton

Cultch is any kind of hard material or substrate that oyster larvae can use for settlement. Oyster shell is the most commonly used cultch, but almost anything hard will work and has, including sticks and bushes, balls, and pieces of concrete from old bridges and ballpark structures.

Spat-on-shell results when spat attach to shells. Shells with a lot of spat can be moved and planted on the bottom as seed oysters.

Remote setting tanks allow farmers to create seed oysters by putting larvae spawned in hatcheries into tanks located on land near their lease grounds. The tanks hold shucked shell that has been cleaned and aged and is ready for setting.

Seed oysters can take the form of multiple spat-on-shell or they can take the form of one spat attached to one tiny chip of a shell.

Cultchless oysters are created when spat attach to a single small chip of shell. They are typically grown out in cages, bags, or floats which can protect them from predators like blue crabs or cownose rays. They produce nicely cupped oysters for the half-shell trade.

Bottom culture is the term for growing oysters by planting shell to catch natural spat set or spat-on-shell along the bottom of the Bay. This type of farming requires a Submerged Land Lease. More than 80 percent of current leases for oyster farming in Maryland are for bottom culture.

Off-bottom or water-column culture is the practice of using cages, bags, or floats to hold oysters in the water rather than on the bottom for most of their growout stages. This form of farming requires a Water Column Lease.

Triploid oysters are sterile oysters that cannot reproduce but can grow much faster than natural (or diploid) oysters. Nature gave oysters two sets of chromosomes, but scientists developed techniques for packing oysters with three sets of chromosomes (triploids). Triploids cost more, either as larvae or seed oysters, but grow to market size sooner.

2007 qualified that fishery for federal disaster relief funds. Those federal crab disaster funds became the core for a Shellfish Aquaculture Loan Fund created in 2010 and partially funded by capital funds approved by the Maryland legislature. The logic behind this loan fund seems to be this: crabbers who had suffered through drastic harvest declines during the previous decade might benefit by exploring other options for making a living on the water.

Another pot of money came from the state's Port Administration, the agency that is responsible, among other duties, for dredging shipping channels. These funds are targeted for loans to pay for remote setting tanks that farmers can use to create seed oysters. The logic behind this kind of loan: "It is intended to support commercial oystermen to ameliorate the effects of dredging," says Stephen McHenry, executive director of MARBIDCO, short for the Maryland Agricultural and Resource-Based Industry Development Corporation, the group that the state uses to administer its loan programs

Why are federal and state agencies putting up loan money for oyster farm-

Maryland oyster leases by county, October 2015

Lease type	Anne Arundel	Calvert	Charles	Dorchester	Kent	Queen Anne	St. Mary's	Somerset	Talbot	Wicomico	Worcester	Total
Submerged land (SL)	24	11	1	57	1	5	64	24	52	40	10	289
Water column (WC)	2	2	0	19	1	2	22	6	1	0	8	63
Total	26	13	1	76	2	7	86	30	53	40	18	352

Oyster farmers are trying a variety of high-tech and low-tech *approaches to growing this bivalve in Maryland waters, but the state Department of Natural Resources classifies them in only two categories: Submerged Land Leases (SL) and Water Column Leases (WC). The first category primarily covers on-bottom techniques that feature loose shell to catch natural spat set or plantings of spat-on-shell. The second category covers cages, bags, floats, and any other device that holds oysters off the bottom. As the map shows, the busiest centers for both styles of aquaculture are Dorchester County on the Eastern Shore and St. Mary's County on the western side of the Bay.* TABLE SOURCE: KARL ROSCHER; MAP, CREATED BY SANDY RODGERS ON A BASE MAP FROM VECTORSTOCK.COM

ing? Because no traditional lending sources would make this kind of loan — at least not yet. "These are high-risk loans with no collateral, only the personal guarantee of the borrower," says McHenry. The loans come with strings attached: they can be used to buy farming equipment like setting tanks, tumblers, graders, and cages as long as the gear has a 15-year life expectancy. But nothing for trucks, cars, or boats.

The loans are not grants, says Roscher. "It's not free money. We want people to have an investment in this. They have to pay it back." Borrowers start off paying interest only for the first two years, and if they stay current with their payments, they qualify for some loan forgiveness in the latter years. That forgiveness, set at 40 percent during the early years of the program, was later capped at 25 percent.

As those loan repayments come in they go into a revolving fund, and from there the money goes out again in the form of new loans to other farm start-ups. And if oyster farming proves profitable in Maryland, as it has elsewhere, then future loans should come from traditional private credit channels.

The results to date on the loan program bode well for the future. Most farmers are making their payments on schedule, reports McHenry, though one grower lost his farm to bankruptcy and another lost his oysters to Superstorm Sandy in November 2012.

What bodes less well for the future are threats like superstorms, disease outbreaks, and loan defaults. In the mid-1980s a major outbreak of Dermo disease drove many earlier farmers out of business. Farmers now have access to disease-resistant oysters spawned in hatcheries and triploid oysters that grow so fast they can be harvested before the disease can kill them off.

What if a lot of farmers — for a variety of reasons — were unable to pay back their loans? Then the growth of oyster farming in Maryland, which has been so rapid in recent years, could indeed slow down and stall out. "With principal forgiveness at 25 percent, you are only getting back 75 percent," says McHenry. "Ultimately the money runs out."

Any form of farming is a gamble, a bet that weather patterns will yield a good crop, that disease won't kill off the crop, that market trends will yield a good price. All that holds true for oyster farming, but now the state of Maryland has put its money on the table, placing its bets on the energy and creativity of a lot of new oyster entrepreneurs.

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Ted Cooney (center) and his partners *bend their backs to hoist a cage of oysters onto the dock at Madhouse Oyster. Working with him are Scott Robinson Jr. (left) and his father, Scott Robinson Sr. (right).*
PHOTOGRAPH, MADHOUSE OYSTERS

Adventures in Cage Culture

The Downs and Ups of Oyster Farming

Michael W. Fincham

In April 2012, Ted Cooney got one million oysters in mesh bags the size of a cantaloupe and he told himself this oyster farming business was going to be easy. By Thanksgiving his back was a wreck. By Christmas he was thinking about quitting.

Cooney is lean and young-looking with graying hair, a graying beard, and a calm intensity, especially when he's talking about his latest adventure: trying to build an aquaculture company called Madhouse Oysters on a strip of land called Hooper's Island. As a businessman he did his due diligence, in this case a lot of research on gear and a lot of number crunching. And he was able, with some expert help, to figure out a system that should work. He had a plan.

The system he wanted to set up was still somewhat new in Maryland waters: he would pack oysters in cages for most of their growing time. The majority of oyster farmers in the state, however, still grow their oysters on shells spread on a leased piece of ground on the bottom of the Bay. But in recent years nearly half of the new farmers coming into the business are trying to do what Cooney is trying to do: put oysters in cages and floats and grow them in the water above the bottom.

Cooney began by buying bags of tiny, hatchery-spawned oysters, each about one millimeter in size. He would empty the bags into a tank and hold them there until they reached a ¼ inch. From there he piled them into floating upwellers, wooden platforms with wells for eight square tanks and a pump that pushed water up from the bottom, feeding in nutrients and turning tiny oysters into less-tiny oysters.

That's when his back began to give out. As his less-tiny oysters grew into small oysters, the upwellers would fill up, and mud would seep into the bottom. Hoisting an upweller heavy with oysters and river mud took two grown men and left a mark on each. "By the end of the day, you're worn out, your

back is sore," says Cooney, "and the next day you get out of bed and you're hurting yourself in a way that you know you're not able to do this for years."

If the upwellers didn't kill your back, the cages would. They were the next step in his system: they sat on his bottom lease, holding oysters about six inches above the mud. As his oysters sat in the river taking in more nutrients and becoming larger oysters, they kept filling up the cages, just as they had filled up the upwellers. Cooney had to keep hauling the cages up on to his boat so he could clean and sort and split the heavy loads off into separate cages. That first year he was working from a small 21-foot skiff, and every time he pulled a full cage up and over the transom, he hurt his back some more and nearly sank his boat.

Before long Cooney had 100 heavy cages in the water — and that's when he began to think about quitting.

Hooper's Island has become a center *for off-bottom oyster farming with the recent opening of two companies, both of which are trying high-tech approaches to growing oysters for the half-shell trade. Ted Cooney (top) founded Madhouse Oysters in 2012. And Johnny Shockley (bottom, holding oyster) teamed up with Ricky Fitzhugh in 2010 to co-found the Hooper Island Oyster Aquaculture Company.* PHOTOGRAPHS, MADHOUSE OYSTERS (TOP) AND JAY FLEMING (BOTTOM)

Ted Cooney was not raised around watermen and oysters. He spent his younger years in other ventures in other places: hitchhiking around most of North America, serving in Africa with the Peace Corps, fishing in Alaska as a fisherman, learning wooden-boat building in England, and for eight years working as a yacht carpenter back in Maryland. Then for 20 years he was a partner in a company that provided health-care finance services, a job that put him behind a desk and bought him a waterfront home in Talbot County. It was the water view that came with the home that got him thinking about the oyster farming business. A small operation, he thought, something he could do with his kids. He wasn't looking for another adventure.

What sold him on the idea was a visit and boat ride with Johnny Shockley, a man who was raised as a waterman and had already made the move from oyster fishing to oyster farming. Shockley is burly and round-faced with a friendly, outgoing style, especially when he's talking about his own mid-career shift. It was his working, water-level view of a declining public oyster fishery that got him thinking about oyster farming. "I was either going to find some really cool thing to do within the industry," he says, "or I was going to get out."

As he went through his mid-life crisis and career shift, Shockley made a key decision: find a partner who was an experienced businessman. When he was able to link up with Ricky Fitzhugh, a seafood wholesaler, they began a new kind of oyster farming operation. They called it Hooper Island Oyster Aquaculture Company, and they set out to build a "really cool thing" by adopting techniques and gear not found in traditional oyster farming in Maryland.

Instead of planting shell and seed oysters on the bottom like most oyster farmers in Maryland, Shockley and Fitzhugh decided to work with some of the new technologies that were being tried in Virginia. They bought larvae or oyster seed from hatcheries and began putting them through downwellers and upwellers before setting them out in large metal cages. Along the way they found

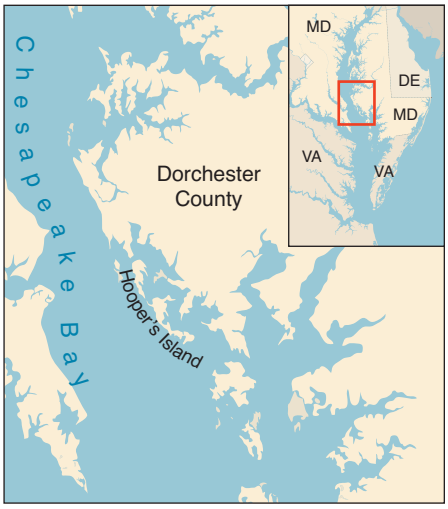
and bought or designed various mechanical gear for hoisting cages and tumbling and grading oysters at different steps along their growth path.

For Cooney, Shockley's operation was a revelation. He toured his plant and took a trip on the *Chesapeake Gold,* a boat Shockley had rigged with gear for hauling out cages and mechanically tumbling and sorting oysters. Cooney was hooked. "There's a big fat worm there and I swallowed it all the way to my stomach," he says. "From that point on I thought, well this is it, this is what I've got to do. And that was the place I needed to do it." After that epiphany he took out a second mortgage on his home and bought an out-of-business crab house on Hooper's Island just across the creek from Shockley's operation.

Hooper's Island seemed the right place for aquaculture. It's called an island, but Hooper's is actually an archipelago of three islands that dangle off the edge of Dorchester County, inserting a thin, crooked strip of land between the Honga River and the mainstem of Chesapeake Bay. Wherever you are on Hooper's, the island offers a water view to the east and, if you turn around, you get a water view to the west. The island also offers oyster growers certain key advantages: the salinity levels are high enough to lend good flavor to the oysters grown there, and the location is well isolated from the floods of oyster-stressing freshwater that can surge out of the Susquehanna River far to the north or out of the Potomac well off to the south.

Cooney's location was ideal and so was his timing. The state of Maryland in 2010 had launched ambitious programs designed to provide start-up funding and technical assistance to would-be oyster farmers. Loans would help. When Cooney did the math he realized that a million oysters would eventually require 500 to 700 cages and the price tag would run between $50,000 and $70,000. When he got two loans from MARBIDCO, the Maryland Agriculture and Resource-Based Industries Corporation, he discovered the loans could not be used to buy a truck or a boat, both of which he would need.

***Ted Cooney (above) with a few** of the double-stack oyster cages he uses to hold oysters during their final growout sequences. To grow small oysters big enough to go into large cages, Cooney uses an Australian Adjustable Long-Line system (opposite page). It features floating baskets hooked on lines and supported by buoys that hold oysters near the surface during this intermediate growth stage.* PHOTOGRAPHS, MADHOUSE OYSTERS; MAP, SANDY RODGERS AND ISTOCKPHOTO.COM



The loans, however, did help him get his first cages in the water. That left him with the problem of getting them out of the water. "By Thanksgiving I had a hundred cages in the water," he says. "And my back was wrecked and my mind was wrecked and I couldn't pick the cages up they were so full."

When the cold weather hit, the oysters slowed their growth, and Cooney had some time to think about his options. "I had basically four months to figure out if I was going to raise the white flag and quit," he says. "Or dive in deeper in some other way."

Was there another way? When Cooney made a list of reasons to quit oyster farming, it quickly reached two pages long. When he made a list of reasons to dive deeper, it had about three lines. One of the lines said: "Get a partner."

When he went looking for a partner, Shockley introduced him to a father/son team: Scott Robinson Sr., a fourth-generation waterman and his son, Scott Jr., a fifth-generation waterman. They already had the interest in oyster farming, but not the money to get started. Cooney had the money, and he'd already started spending it. "I'd gotten started and run out of steam," said Cooney, "so we partnered up." That brought in two more strong backs, a lot of work experience in the oyster business, and local connections.

Partners were one way to keep going. Cutting down on the backbreakers was another. Shifting into his problem-solving mode, Cooney rethought his system and decided to jettison the floating upwellers that were so heavy to lift. In their place he adapted and installed in the Honga River a technique invented in Australia, an adjustable long-line system that featured a series of lines, buoys, and floating baskets that could hold his tiny oysters along the surface until they grew large enough to go into one of his cages.

His new boat was another way to keep going, but it looked nothing like

the yachts he used to work on. It was a workboat of his own design: a pair of pontoons, some connecting beams, a deck — "it looked like a floating tennis court" — and then a roof made from the cover for an in-ground swimming pool. The result, he admitted, was "certainly the ugliest boat on the Bay." But it was flat and stable, a workspace that he could load with gear that would save his aging back. He put in a conveyor, tumbler, grader, and a hydraulic rig with a big hook and block that could hoist his cages and swing them aboard.

With the new lift, his 15-year-old daughter can now haul the cages. With his ugly boat Cooney claims he and his crew can work more cages in a day than anybody on any other boat. Maybe some day soon Tidewater seafood festivals with their popular workboat contests for watermen will have competitions for oyster farmers.

That first year, Cooney saw most of his crop die, and it took a year and a half to rework his system and get it up to speed. Losing oysters, he's discovered, is a normal part of the farming business. "For cage culture people," he says, "if you get 50 percent to the finish line, then you're doing pretty well." By 2015, he was doing well enough to sell about 250,000 oysters, packing them in 100-count boxes and charging high prices for a high-quality product. Now he's got four million oysters in his baskets and cages and should soon be selling a million oysters. That, at least, is the plan.

As oyster farming evolves in Maryland, Cooney and Shockley may or may not prove to be models for other farmers in the future. But there are perhaps some interesting lessons about what it takes to start up successful, off-bottom oyster farms. It takes money of course, whether from savings, private investments, or state-supported loan programs. But the money seems less important than other things: energy, ambition, the ability to find partners, the flexibility to alter course, and a sense of adventure.

Some of that energy seems to come from a sense of social mission. At the Hooper Island Oyster Aquaculture Company, Shockley and Fitzhugh say they want to build a business that will work with other growers, in part because new companies create work in a region which has lost jobs and people as a result of declining harvests in the traditional oyster and blue crab fisheries. It's also good business for Shockley and Fitzhugh: they also sell equipment to other growers. And they've developed markets that range from high-end restaurants, seafood sellers, and Whole Foods stores to individual oyster lovers who can go online and order a shipment. "We're ready to bust this thing out," says Shockley. "We need oyster growers, we need product."

According to Cooney, oyster farming, if done right, can create not just jobs but careers. "It's a lot of brutal hard work," he says, looking back on the struggles of his first year. "But if you can think through the processes and try to design them so they're easier and you're using machinery rather than brute strength, then you can have a workforce that can expect to make this their career. So that's what we're after. We're after young guys who like the idea of oyster farming, who know that I'm not going to wreck their backs and send them down the road after two years."

Social mission has been a long-term issue with Cooney. When he worked in Africa with the Peace Corps, he saw young people losing their chances at a better life, in part because their villages lacked drinking water. Every day young boys and girls make long treks to find drinking water and then carry it back home. Instead of sitting in school learning to read, they spend hours each day trudging up and down a dusty road. It's a problem you don't forget, especially if you like solving problems. His solution: drilling wells in the village for drinking water. That's not an original idea — but this idea is: his oyster farming company plans on spending five percent of its profits to get wells drilled in some of the villages he saw years ago.

He's already hooked up with a well driller, Kenny Wood from the Eastern Shore, who spends part of each year drilling wells in African villages. In December 2015, Cooney's company wrote its first check to Wood. You can call that charity or a sense of social mission — but it's also a chance to feed an old itch for adventure. Cooney figures the well driller will need a helper. And he has his passport ready.

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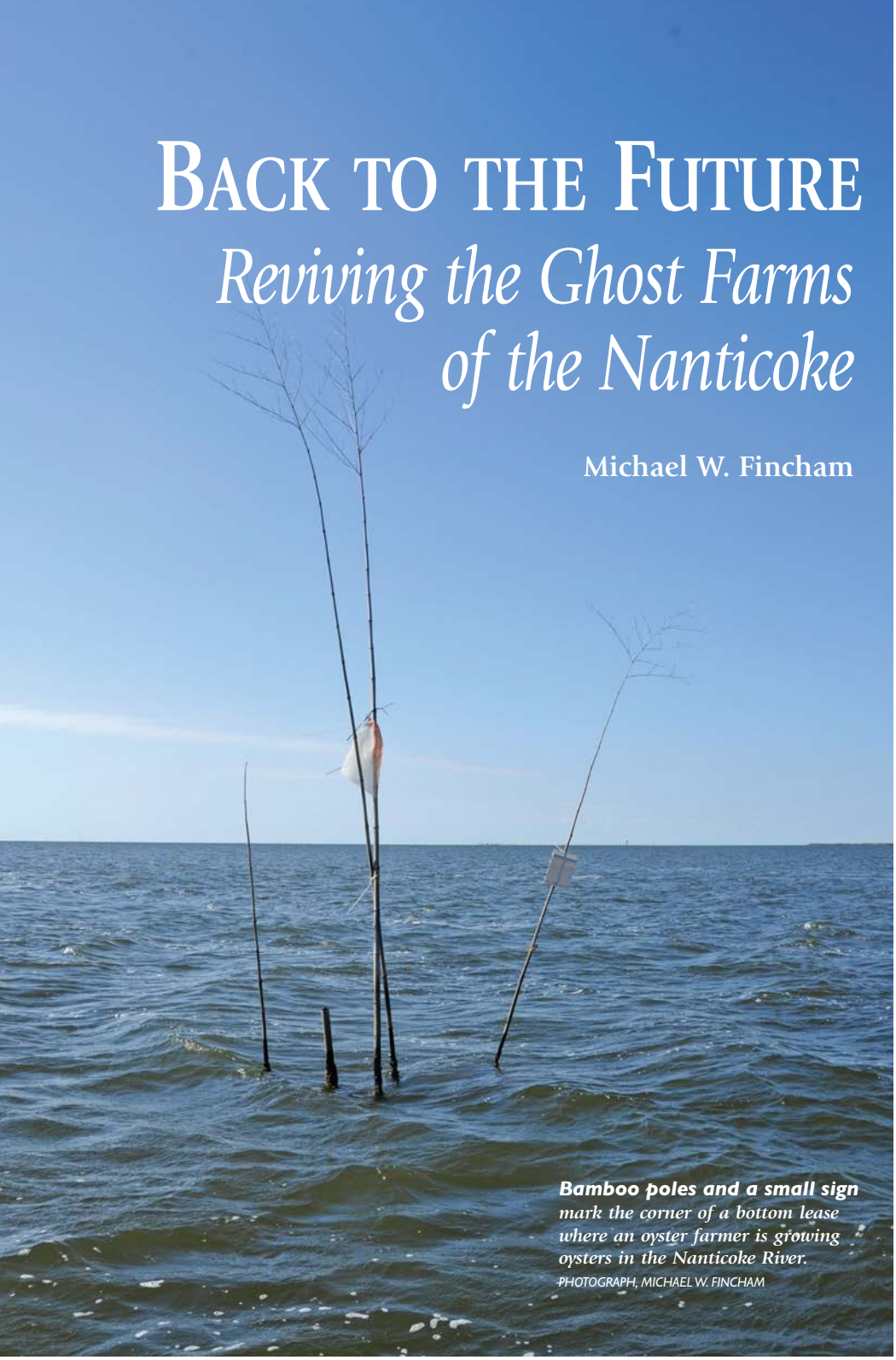
Back to the Future

Reviving the Ghost Farms of the Nanticoke

Michael W. Fincham



***Bamboo poles and a small sign** mark the corner of a bottom lease where an oyster farmer is growing oysters in the Nanticoke River.*
PHOTOGRAPH, MICHAEL W. FINCHAM

Eric Wisner seems, at first glance, to be going nowhere. On a mild, windless October day, he is steering his boat in endless circles out in the middle of the Nanticoke River. His boat is a converted, stripped-down houseboat, and he's using it to drag a dredge across a long-deserted, underwater oyster farm where, once upon a time, somebody spent money trying to grow oysters — and eventually gave up.

Wisner, however, is not giving up on oyster farming. Today he is trying to cash in on a bet he made last year. That's when he shelled out $300 to apply for a lease from the state of Maryland to work these abandoned acres on the bottom of the Nanticoke. A friendly, talkative 46-year old, Wisner sports a reddish beard and a ready smile, and he seems happy to be out here driving his boat in circles. When his wife asked him why he was going out today, he told her what he tells me: "Hunting for a vein of Chesapeake gold," he says with a laugh, "an old vein of Chesapeake gold."

The gold he's hunting may have been left behind by the pioneers who gave up oyster farming leases on these acres more than 30 years ago. That means for decades now nobody has planted new shell on the bottom, nobody has planted seed oysters on top of that shell. Wisner knows that, but he has several hunches he wants to test.

His first hunch: perhaps there's still a lot of old shell and a firm bottom down there. If so, he can plant seed oysters here in the future. His second hunch: perhaps there are still some live oysters down there he can harvest and sell.

Perhaps, on the other hand, he just threw away his $300.

There are a number of ghost farms like this scattered along the bottom of the Nanticoke. Bordered mostly by marshes and woodlands, the river is one of the loveliest and least populated on Maryland's Eastern Shore, and for decades it was one of the few places where oyster growers did well — at least for a while — during the long era when the state did not encourage the farming of oysters on private leases along the bottom of the Bay.

For more than a century and a half, any stretch of Bay bottom in Maryland that held oysters was protected as public oyster grounds and reserved for harvesting by watermen with hand tongs, dredges, and diving suits. Would-be oyster growers who wanted to lease Bay bottom were stymied by state laws that limited the size and number of private leases, and those who managed to get leases were often robbed by poachers and pirates who helped themselves to an oyster crop other people had planted — and did so with impunity.

But along the Nanticoke, a number of pioneer oyster farmers found ways to

A recent convert to oyster farming, *Eric Wisner surveys the shuttered, vacant buildings of the once-busy seafood packing company run by H.B. Kennerly and his son. For decades, their various companies bought oysters from farmers who grew them on private leases and from watermen who fished them off the public grounds. They shucked oysters year round, shipping them to cities in the south and west and supplying local farmers with the shucked shell they could plant on bottom leases along the Nanticoke and Wicomico Rivers.* PHOTOGRAPH, MICHAEL W. FINCHAM

work around legal restrictions and illegal poachers. They applied for as many leases as they could under the laws, and then got their family, friends, and neighbors to apply for more. Everyone kept an eye out for any poaching on their neighbors' plots, and some farmers even hired guards to patrol the grounds. By 1980 the Nanticoke River held 25 percent of all the private oyster leases in Maryland waters.

Oyster farming in that era was mostly low-tech bottom culture. Growers planted their leases with shucked shell and made a bet that spawning by local oysters would create a lot of oyster larvae floating in the water and that would lead to an abundant natural set of new oysters on their shell beds. On the Nanticoke for many years, it was a bet worth making. When they could afford it, growers purchased and planted seed oysters, shells already dotted with tiny oyster spat. Most of this spat-on-shell came from the great beds of seed oysters in the James River in Virginia.

Many farmers would plant more than a million seed oysters per acre and harvest more than 500 bushels of market-ready oysters per acre, reports Don Webster, a Maryland Sea Grant Extension specialist who analyzed a 1979 survey of growers in the state. Some farmers reported harvests above 1,500 bushels per acre. An aquaculture advocate named Max Chambers even built a small hatchery along the Nanticoke where he spawned oysters, collected larvae, and created his own spat-on-shell for planting in the river.

The result? "Maryland had a huge aquaculture industry 30 years ago" says Mike Naylor, "despite attempts by the commercial oystermen's legislators to slow it down." Naylor was the state official who signed off on lease applications, and in his opinion the aquaculture success story in the Nanticoke region has been largely missed by journalists and historians. "Aquaculture in Maryland is growing quickly right now," he says, "But it will be a long time until we reach the level of aquaculture production that existed in the early 1980s."

Eric Wisner kicks his winder motor into gear and begins winching up a dredge load of stuff off the bottom of the Nanticoke River. He's hoping the stuff in the dredge includes some live oysters, a vein of old gold that's been waiting down there. "It's the first day," he says. "Got no idea what's here."

The load lands with a splatting thud on his metal culling board and Wisner begins to get a good idea about what

these ghost acres hold. He and his two-man crew start sorting through what appears to be a pile of old shells, all dark and dripping and mottled with tan clots of something that may be sea squirts — at least that's the best guess that his crew, after some discussion, can come up with.

He's working with crew members today who carry in their heads a lot of history about the river. Mike Lindemon is a gray-bearded 66-year-old who remembers diving under the winter ice for oysters back when underwater visibility reached 30 feet or more. He sorts through this mess of empty, sharp-edged shells and when he finds a live oyster — and there are only a few in this pile — it's usually stuck to an old shell. He flips the clump to Bill Denherder, who whacks it with a hammer-like measuring tool and keeps whacking until he's sculpted a clean, shapely oyster. This he tosses into a bushel basket behind him.

Denherder can deliver a strong whack. He's a big man, nearly 6 feet 4 inches tall and all of 69 years old, with a deep voice and a long memory. As he hammers oysters he talks about the years when you could make a good living on the Nanticoke — and the years when you could not. You could oyster on the public grounds in winter, go gill netting for rockfish, then work your private oyster leases in April and May until blue crabs showed up. "Back in those days," he says, "you could crab 24 hours a day, seven days a week — if you could stand it."

Oysters, however, were always the key option. Denherder worked his own leases back then: 60 acres worth of bottom where he usually harvested oysters in the spring before the blue crabs showed up. "Oysters used to be king on the Nanticoke," says Denherder, hammering at a clump of shells.

Another dredge load arrives with another thud — and with it comes a memento from those earlier days. Reaching into the wet pile, Denherder extracts an old black work glove that's been stuck on the bottom tangled in a pile of shells for years. When he holds it up we can see a small oyster stuck tightly on the glove, a spat that's grown into a two-year oyster with a fully formed shell.

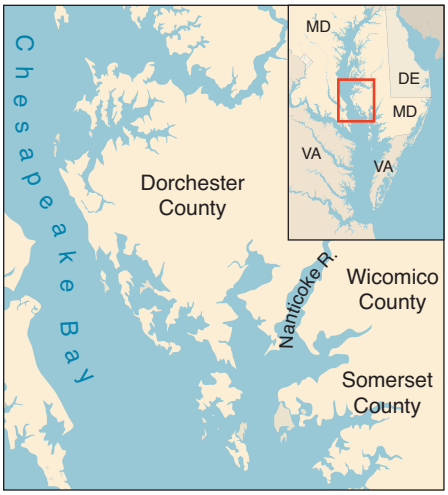
Eric Wisner (above, left) and Bill Denherder *unload a bushel basket of oysters harvested off one of Wisner's bottom leases in the Nanticoke River. Wisner designed his own workboat by converting an abandoned houseboat he found half sunk in a nearby harbor (opposite page). He stripped away most of the house structure and added a culling board, a crossbar framework and mast. The result: a wide, stable platform for power dredging and hauling oysters off his bottom leases.*

PHOTOGRAPHS, MICHAEL W. FINCHAM; MAP, SANDY RODGERS AND ISTOCKPHOTO.COM

It is an arresting image, this black rubber glove: it was most likely lost by a farmer who once stood right about here on this river, riding another boat, working another culling board in another era. This long-gone grower sorted through oysters and shells with his black-gloved hands, only to lose his glove and eventually give up his lease and whatever hopes he had of making a living off the river. On his lost glove the finger tips are now jagged holes, ripped open by old shells and rotted by time.

At moments like this the Nanticoke seems a haunted river. Every day when Wisner and his crew motor out to work these leases, they pass another ghostly memento of better days: a deserted shucking house and fish-packing center that was once the beating heart of the region's seafood industry. This was the home site for a number of businesses operated by the H.B. Kennerly & Son Company for half a century. This is where those early growers came to get the shells they needed to plant their underwater farms. This is where they came to sell the oysters they managed to harvest. But what Wisner now sees every workday morning is something sad: a sprawling collection of crumbling wooden buildings that stand locked and vacant, looming over the entrance to Nanticoke's town harbor.

If there's a ghost haunting these empty, echoing buildings, it would be Harold B. Kennerly Jr., a grower and entrepreneur who helped so many oyster farmers do well in this river. For decades the younger Kennerly ran a business that could buy and shuck and ship oysters across the country, and he did it all year round. During winter season he bought oysters from watermen who tonged and dredged the public grounds. Many of those watermen also had bottom leases and they used them to store some of their winter catch of wild oysters, waiting for prices to rise. Once their season ended, Kennerly bought product from them (at higher prices now) and from those farmers who cultivated private leases. He also harvested the many private leases he and his family and his workers had acquired along both the Nanticoke and the nearby Wicomico River.



As a result he became the largest employer in the county. To keep his plant humming, he also developed markets for breaded clam strips and breaded squid strips, and four times a year he even brought up shiploads of frozen tuna from South America to be canned and sold to markets in the northeastern U.S. But mostly he kept his workers busy shucking and packing oysters and loading them onto tractor-trailer trucks. Stacked with canned oysters from these quiet Eastern Shore rivers, those trucks rumbled down the two-lane roads of Wicomico County for decades, headed for big-city markets around the country.

Oysters were king — and suddenly they weren't. In the mid-1980s, two diseases, MSX and Dermo, swept through the mid Chesapeake and year after year killed oysters before they could reach market size. "It wasn't a one-time thing," says Denherder. "It was killing everybody." Like all the watermen and growers he knew, Denherder no longer had healthy oysters to sell to Kennerly. And the plant no longer had shucked shells to sell to the farmers.

After the oyster calamity hit, the rockfish calamity arrived. In 1985 the state of Maryland declared rockfish "a threatened species" and enforced a complete moratorium on the catching, selling, and buying of rockfish. The two calamities turned watermen and oyster growers into endangered species. "That only left crabbing," Denherder says, "And you can't make a living just crabbing."

Denherder, at least, had another option: a land job. He turned his workboat over to his son and focused on installing heating and air conditioning systems for industrial clients. "The water was always either feast or famine," he says. When famine came, Denherder did what so many growers did: he gave up his leases and let his underwater acres become a ghost farm.

As his crewmates sort and hammer through another shell pile, Wisner swings his dredge overboard and checks his location using a variety of tools: his high-tech GPS, his depth finder, and his no-tech bamboo pole. Before he drops his dredge he leans over and starts poking at the bottom with his pole. When he starts tapping hard shell, he drops his dredge to the bottom, spins his steering wheel, and starts carving yet another wide circle through this abandoned oyster lease.

This is a fairly easy day for the crew. The work falls into a relaxed rhythm: Wisner drags the dredge in a circle, his crew sorts through each load, picks out a couple oysters, and sweeps the remaining mess overboard. Halfway through the morning, he has filled up four plastic bushel baskets with oysters. At $38 a bushel, that puts him halfway to covering the $300 he spent on the lease.

Wisner is not just scavenging this ghost lease for leftover oysters; he's also testing out this patch of bottom to figure out whether it's worth cultivating next year. That might mean firming up the bottom with more shell and other substrate and planting seed oysters that he could harvest three years later. If this ghost farm is worth the investment, he would add it to his inventory of working leases. That inventory now includes 42 leases covering more than 1,000 acres of bottom in the Nanticoke and the Wicomico Rivers.

Oyster farming is clearly reviving along these rivers, and the revival is being driven in part by the state's decision to encourage rather than discourage aquaculture entrepreneurs like Wisner. In 2009 historic legislation introduced by then-Governor Martin O'Malley swept away the long-standing restrictions that for a century and more limited the size and number of private leases.

The state did more than remove old barriers to aquaculture: it helped oyster farmers get started. It provided low-cost loan programs, training workshops, and technical assistance to help farmers apply

Don Meritt holds a workshop for would-be oyster farmers, *demonstrating how to distribute hatchery-spawned oyster larvae in a remote setting tank. The tank holds shucked shells which the larvae will settle on and attach, creating spat-on-shell that farmers can plant on their bottom leases in the Chesapeake Bay. The result — about three years later — should be market-size oysters. Meritt, a Sea Grant Extension specialist, first imported this technique from the West Coast in 1982. In recent years it has become the mainstay of the new surge in oyster farming in Maryland.* PHOTOGRAPH, MARYLAND SEA GRANT EXTENSION

for leases and loans, get surveys of their lease grounds, prepare bottom areas for cultivation, and learn to use current aquaculture techniques.

Teaching those techniques were Maryland Sea Grant Extension specialists who worked with local growers and operated the oyster hatchery at the Horn Point Laboratory of the University of Maryland Center for Environmental Science. In collaboration with the nonprofit Oyster Recovery Partnership, Extension specialists organized workshops showing growers how to create their own seed oysters by putting hatchery-spawned larvae into setting tanks located on land near their lease grounds. Hatcheries and setting tanks would become essential innovations for the future for oyster farming in the Chesapeake.

The future had already arrived in the region decades earlier. Back in 1982 Don Meritt and Don Webster hauled two large tanks down to the town of Nanticoke's harbor and set them up on the shore alongside the rambling white buildings of the busy Kennerly seafood plant. These Maryland Sea Grant Extension staff were starting a program to teach local growers and would-be growers how they could create their own seed oysters by working with a new technique called "remote setting."

At the Kennerly site, they installed a pump to fill the tanks with river water and a blower to keep the water circulating and then began working with local growers to clean piles of shucked shell that would go into the tanks. For easy handling they packed the shell into plastic containers and lowered the containers into the tanks. Then they opened small bags full of dark soggy stuff. It looked like mud but this mud was made up of millions of oyster larvae that had been spawned in a hatchery. Meritt and Webster and their growers spread the larvae in the tanks where they were supposed to find a friendly shell, glue themselves in place, and become spat-on-shell. Then they waited.

This remote setting technique came from the U.S. West Coast where Don Meritt had visited and worked with a number of well-established growers in Washington state, probing them to learn the keys to their success. The advantages of this West Coast technique were obvious for growers along the Nanticoke. Instead of waiting and hoping for good years of natural spawning and spat set by wild oysters in the river, they could get oyster larvae from a hatchery. And spat set could happen in tanks set up at remote locations near the rivers where the growers had their leases. Growers would not have to haul truckloads of seed oysters from hatcheries or bring boatloads up from the James River. They could simply carry small packets of hatchery-spawned oyster larvae and unleash them in setting tanks.

The advantages seemed less obvious back in 1981 when Meritt and his growers checked the larvae a day later and found they were all dead. As Webster later wrote, a lesson was learned: shell has to be cleaned even more thoroughly, because leftover organic material could kill off the larvae. Other lessons were also learned and passed on to growers along other rivers. At one point Extension staff put a tank on a trailer, complete with a pump and a blower and drove their "spat mobile" into four other counties, teaching the technique to other growers along Maryland's Eastern Shore. Aquaculture, despite all the legal limitations on leasing, seemed to have a future.

That future died when Dermo and MSX came alive again. In 1985 these parasitic diseases exploded in the rivers and mainstem of the Bay, creating ghost farms along these rivers, bringing the travels of the spat mobile to an end, and shutting down those ambitious Extension programs that were trying to train the next generation of oyster farmers. Remote setting had been an idea ahead of its time.

Eric Wisner was 16 when those disease outbreaks devastated oyster farming in Maryland waters and he was 40 years old when the future came alive again. In 2010 state agencies launched a historic effort to finally enable and revive and expand oyster farming. He was running a

firewood business at the time, but he quickly tried every new state aquaculture program. He applied for leases and loans and when Meritt and Webster once again brought tanks back to Nanticoke several years ago, he began showing up at their workshops and signing up for setting time at their tanks.

The old Kennerly plant was closed by then, but oyster farming was about to bloom again along his old river. Remote setting was an idea whose time had finally come. Hatcheries and remote setting tanks are, in fact, the basic building blocks for most of the new aquaculture options being tried along the rivers and shorelines of the Chesapeake Bay.

Wisner, at least, saw setting tanks as a key to his future. When he could start buying his own tanks, he tried setting up his first one in the back of a pickup truck lined with plastic. "You don't need much more than a kiddie pool," he says now, "It might hold ten bushels of shell. You just put less larvae in there." Next he got bigger tanks and tried setting them up in the backyard of his mother's house down at the end of Nanticoke Road. When she started fussing about his truck and trailer leaving tracks in her yard, he had to go looking for other options.

Along this river the future of aquaculture looks a lot like the past. In many rivers in Maryland the new aquaculture is trying to go high-tech, with growers signing up for water-column leases so they can put oysters in floats along the surface or in bags hanging from long-lines in the water or in metal cages that sit just above the bottom. You can find options like these along the Choptank and the Honga up in Dorchester County and along the Patuxent and the Potomac and other rivers and creeks on the western shore. Along the Nanticoke, however, the new aquaculture is old-school: there are 64 active leases in the river, all of them bottom leases. No cages, no floats, no long-lines.

There is, however, plenty of energy and creativity and low-tech innovation.

Along the Nanticoke River, the new aquaculture is old-school: there are 64 active leases in the river, all of them bottom leases. No cages, no floats, no long-lines.

When Wisner needed a workboat for dredging his grounds, he made his own. He found a houseboat sitting half sunk at Whitehaven harbor up along the Wicomico. He refloated the wreck, hacked away the house frame, and added a high metal crossbar near the bow, a mast with a winch, and a motor and winder for pulling the dredge.

When he needed a workboat for hauling shell and substrate materials, he found another houseboat and reconfigured it also. When he wanted a faster, easier way to dump his material on his lease bottom, he got a chicken manure spreader from a farmer and mounted the contraption on the front of his boat.

When the price of shells, which make good substrate, kept going up, Wisner found a cheaper option. He went to the Horn Point Hatchery where shells are stockpiled and aged and washed, and he asked for the grit and flakes and odd stuff that ends up at the bottom of the piles. They are called "oyster fines," a cheap, useful kind of substrate that he hauls away, piles onto the deck of his second workboat, and casts out on the river through his chicken manure spreader. He thinks it works like a fast-hardening glue, helping firm up the bottom where he can start planting the seed oysters he pulls out of his setting tanks.

The state of Maryland is making a small bet on Eric Wisner by providing a few loans. He is already paying them back, but small loans add up, and so do large loans that are going out for high-tech forms of farming. They add up to a huge and historic bet on the future of oyster farming. One bet is that the money will come back to the state in the form of successful, tax-paying businesses, many of them putting people back to work in less populated Tidewater areas no longer well supported by harvests fished off the diminishing natural oyster reefs.

The state seems to be winning its bet on Eric Wisner. With his energy and smarts, his low-cost strategies, and his 1,000 acres of bottom, Wisner seems to be king on the Nanticoke.

As he steers his self-made workboat back towards the Nanticoke harbor, Wisner starts counting his catch. "We got 3, 4, 6, 8, 10 bushels," he says. "At $38 a bushel there's $380."

That's not much of a haul compared to the 40 bushels he usually harvests from a day's dredging on his working leases. And that's not much of a payday compared to the $60 a bushel he gets during the summer.

But do the math: he's won the bet he made last year when he shelled out $300 to buy the lease rights to these abandoned acres. The real payoff is what he's learned: there's still a good heaping of shell and other substrate down there, a base he can build on next year when he fires up his remote setting tanks and starts making more seed oysters.

As he motors into the town harbor, he can see his tanks sitting up high on the bulkhead that lines the entrance to the boat basin. When his mother asked him to move his tanks out of her yard, he brought them here. He leased land on the site of the old abandoned shucking house that H.B. Kennerly used to run. Looking, as always, for a better, cheaper deal on the rent, he promised to keep the lawn mowed and the trash cleared away.

Then he installed his two tanks, large and round and tan, setting them right in front of all those sad, white, sagging buildings.

It looks like the perfect site: the old aquaculture and the new sitting side by side on the shores of the Nanticoke.

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More on Oyster Aquaculture

The call to open more Maryland waters to oyster farming is not new. Over the last 120 years that recommendation has come from various oyster commissions, scientific task forces, and citizen associations — and it was largely ignored.

Until 2009. That's when yet another Governor's Oyster Advisory Committee issued its final report and the General Assembly responded by passing historic legislation that finally removed long-standing legal barriers to oyster farming and opened new areas of the Chesapeake Bay's bottom to private farming. That decision pleased oyster growers and appalled the president of the Maryland Watermen's Association. He called it "the worst disaster in Maryland history."

What happened? How did this commission succeed where so many others failed? Will this historic decision prove a disaster or a savior for the seafood industry? Two stories in the online version of this issue of *Chesapeake Quarterly* provide some answers and some more questions: **The Longest War** examines the debates behind this decision. **To Catch a Thief** explores the popularity of poaching on private leases, a long-standing problem both for police and for all those new oyster farmers.

Jay Fleming

Read these online stories at:
www.chesapeakequarterly.net/CQv14n4

New Science Writer Joins Communications Team

Daniel Pendick

Maryland Sea Grant has a new science writer, Daniel Pendick. He will cover the breadth of Chesapeake Bay science as well as the education and community outreach efforts of Maryland Sea Grant Extension. He succeeds Daniel Strain, who left the position earlier in 2015. "What excites me most is the chance to report on the extraordinary effort to restore and manage the Chesapeake Bay on the ecosystem scale, with all its wonderfully messy social, economic, and political dimensions," Pendick says

A native of New York state, Pendick grew up clamming, fishing, beach combing, and snorkeling with his four brothers on Long Island Sound. He says writing about the Chesapeake Bay environment is a kind of homecoming for him. "Replace the oysters and crabs with clams and flounder, and you pretty much have my childhood dinner plate," he says.

Pendick studied literature and rhetoric at Binghamton University in New York. He completed a master's degree in the history of science at the University of Wisconsin-Madison. To pay the bills, he also worked as a science writer for the university. That led to an internship at *Science News* magazine and then a series of opportunities to hone his craft at other science magazines, either as a staff writer and editor or freelance contributor. Among other topics, he's covered extreme weather, earthquakes, volcanoes, climate change, dinosaur evolution, neuroscience, and cosmology. Most recently, he served as chief writer and executive editor of *Harvard Men's Health Watch*.

Pendick also brings experience in graphic design, illustration, and digital media, which he hopes to put to good use — along with a passion for plain language and strong verbs — as a contributor to Maryland Sea Grant's many print and web publications, including *Chesapeake Quarterly* magazine and *On the Bay* blog.