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The Mouth of the Bay Counting Our Blessings



Executive Director
Bob Rheault

As the days grow shorter, we find ourselves struggling to adapt to daylight-wasting time and gearing up for the holiday season. Around this time of year I like to pause and reflect on everything I have to be thankful for.

On the home front, I count myself fortunate to have two great kids; a nice, warm house; and a wife who puts up with me (and does a great job editing and laying out this newsletter).

I am thankful that the ISSC conference is over and we won't have to deal with *that* again for two more years. It was a lot like Christmas—we didn't get everything we wanted, but we didn't get a lump of coal either.

I am thankful that the Senate Agriculture Appropriations Committee has approved funding for two more USDA shellfish geneticists to work on East

Coast issues, and three to tackle West Coast concerns.

I am thankful that a consortium of East Coast geneticists has received a five-year, \$4.4 million grant to elucidate the functions of thousands of genes in the Eastern oyster genome.

I am also thankful that the USDA Risk Management Agency continues to work on developing better crop insurance policies for shellfish farmers.

I am thankful for the support of a professional extension community that helps us navigate the complex challenges of permitting new farms and growing shellfish in the face of the multitude of trials that Mother Nature seems to dish out every year.

And I am thankful for all the scientists who labor tirelessly, doggedly pursuing answers to the many questions we still have about growing shellfish.

But most of all, I am thankful to be advocating for such a wonderful group of hard-working, inventive and resilient shellfish farmers. It is an honor and a privilege.

When you go through your list of things to be thankful for, I hope the ECSGA is on your list.

Happy holidays!

ISSC Biennial Meeting Wins and Losses for Industry

by Robert Rheault,
ECSGA Executive Director

In early October around three-dozen industry members joined at least 50 state shellfish regulators and a phalanx of federal officials from the Food and Drug Administration (FDA) and Centers for Disease Control and Prevention (CDC) in San Diego for the five-day biennial meeting of the Interstate Shellfish Sanitation Conference (ISSC). It will be a few more weeks before we see the Summary of Actions, and then it could be months before the FDA decides whether it will veto any of those actions. Once the FDA weighs in, all of the changes we voted on will become regulations. Following is the *Cliff's Notes* summary of what transpired.

Since we were tasked with evaluating over 100 proposed changes to the National Shellfish Sanitation Program (NSSP), many of us spent weeks preparing ahead of the meeting, reading more than 1,000 pages of material and participating in about 15 hours of conference-call discussions. Dozens of committees and work groups met for hours to refine proposed rule changes, and then three task forces convened to vote on each proposal.

As usual, the results include both wins and losses. Some proposals were adopted, others were rejected

outright, and many were sent back to the various committees to be perfected over the next two years, then reconsidered at the next ISSC meeting in 2021.

Vibrio illnesses

Much of the work of this year's conference was dedicated to addressing the CDC's perception that *Vibrio* illnesses are on the rise. The agency presented confusing graphs conflating wound infections with food-related illnesses, managing to both fail at making a convincing argument and irritate conference attendees. Landings data show that states are reporting declines in illness rates per meal, suggesting to me that increases in *Vibrio* illnesses are related to increased production and improved detection, as opposed to poor handling.

Another big concern being raised by the FDA and CDC is the association of most illnesses with people who ate more than one type of shellfish at a meal. Many (if not most) consumers enjoy eating different varieties of shellfish when they go out to eat. With these "multi-source illnesses" it is impossible for investigators to

know which shellfish is at fault. Typically, when an illness outbreak is associated with one shellfish harvest area, officials can perform an investigation of the growing waters and the dealer shops to see if there is a reason to close that area or to demand a recall of contaminated product. When multiple shellfish sources are implicated it is virtually impossible to

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Taking Mussel Farming Offshore

Kristen Jabanoski,
Science Communications Specialist, NOAA
NEFSC/Integrated Statistics, Milford, Conn.

National Research Council Postdoctoral Scholar Dr. Darien Mizuta and NOAA Milford Lab Director Dr. Gary Wikfors recently analyzed environmental conditions in New England's offshore waters to find ideal spots for mussel farming. They also ventured offshore themselves to check on the performance of mussels at the Atlantic Coast's first experimental offshore farm, located seven nautical miles off of Cape Ann, Mass. Their findings were recently published in the [Journal of Marine Science and Engineering](#).

In this context, offshore refers to federal waters, or the U.S. Exclusive Economic Zone (EEZ), from 3-200 nautical miles from shore—the second largest EEZ in the world. While the majority of shellfish farms are currently found in shallow coastal areas, there are advantages to taking shellfish aquaculture offshore. Offshore waters offer more stable environmental conditions, less land-based pollution and vessel traffic, and reduced risk of getting in the way of other people using the ocean.

Americans' taste for mussels is growing, and consumption has been

increasing year over year. Right now, as with 90 percent of our seafood, most of the mussels we eat are imported, and most are farmed in Canada.

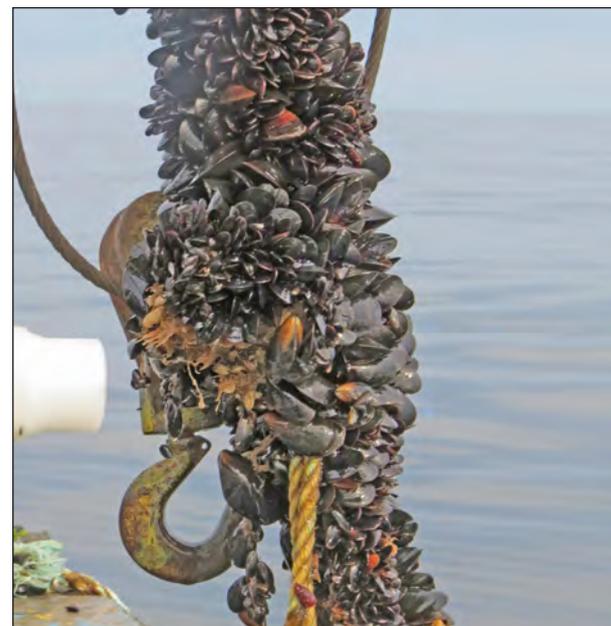
Two of the most critical environmental factors for growing mussels are temperature and food availability. In this study, the researchers used chlorophyll data from 2005-2012 to estimate food availability. The good news from this assessment: there is more than enough mussel food (phytoplankton) in the water throughout the year at all of the sites they looked at, from the south side of Long Island to the New Hampshire coast. Offshore New England waters are fertile pastures for mussel farming.

Using a large-scale, open-source, ocean-temperature dataset from 2005-2012, including vertical depth profiles for six stations, Mizuta and Wikfors found that summer temperature is the limiting environmental factor for siting a mussel farm. Temperature affects not only the strength of the byssal thread—which mussels use to hang on to mussel rope—but also feeding, reproduction and overall condition. The optimal temperature range for mussels is from about 50-57°F. While the water is well mixed in the winter, during the summer it stratifies into steep temperature gradients with depth, called thermoclines.

To keep the mussels chilled to their ideal temperature in the summer, the researchers estimate that growers in northern



MARK DIXON/NOAA FISHERIES
Dr. Darien Mizuta of the Milford Laboratory, at sea studying blue mussel growth at an experimental offshore mussel farm near Cape Ann, Mass.



MARK DIXON/NOAA FISHERIES
Line with blue mussel growth from offshore experimental farm site.

New England should submerge their mussels approximately 50 feet below the surface, while in southern New England they should be kept at least 66 feet deep. Growing mussels deeper has the added benefits of reducing the fouling animals that can grow on them and avoiding predators such as hungry ducks.

With current farm designs, it may be possible to adjust the depth of mussel rope to keep the animals within their ideal temperature range. Recommended depths for mussel farming can also be adjusted to future temperature increases associated with climate change.

In addition to predicting the ideal depth, Mizuta and Wikfors used temperature to identify geographic areas most suitable for mussel aquaculture. Out of the six stations considered, the most promising are offshore Long Island (N.Y.), Cape Ann (Mass.), and New Hampshire, due to their shallow thermoclines.

The NOAA Milford Lab scientists tested their findings against real world conditions by measuring feeding rates and the condition of mussels, along with environmental variables, at the ideal depth (50 feet) on the experimental farm. This field work was a collaboration with the Northeastern Massachusetts Aquaculture Center (NEMAC) and Salem State University. They conducted feeding experiments at the farm in early spring (May) and summer (August), using a portable flow-through device, and pumping water and natural algae from 50 feet below the surface to measure feeding performance of the animals.

Feeding performance was satisfactory across the board, although mussels had higher filtration rates in spring than in summer.

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HOT AQUACULTURE NEWS!!



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Aquaculture Permitting: Why Can't We All Just Get Along?

by Robert Rheault,
ECSCGA Executive Director

Looking at the various gear options available for farming oysters, three classes rise to the top: floating gear (such as the OysterGro), long-line gear (like the SEAPA or Hexcyl baskets) and various flip-bag designs. Growers comparing these three gear classes to bottom cages find that they are easier to work with, produce oysters with a better shape and fuller meats, and often result in dramatic improvements in survival rates.

But there is a huge drawback with these types of gear: they are all highly visible and prone to drawing attacks from waterfront homeowners and boaters. Permitting battles over floating gear installations and long-line arrays seem to be the new normal. Growers naturally want to deploy the best gear available, but opposition in many communities has been fierce.

Some places have gone so far as to enact moratoriums on lease permits or to attempt passing legislation limiting aquaculture. Thankfully, most of those attempts have failed, but in many states aquaculture opponents have found they can delay applications for years by suing the permitting agency. Most often this approach eventually fails, but occasionally lawsuits have tied up applications for years.

Public resource agencies are tasked with managing a mixed-use, common-property resource to accommodate navigation, shipping, recreation, fishing and aquaculture. State constitutions typically charge managers with preserving access and protecting the environment, while also maximizing the value of the commons to the "sovereign." This means that managers must try to balance multiple uses for all residents of the state, not just boaters or waterfront homeowners. Shellfish farms check all the boxes for job creation, sustainable seafood production and negligible negative environmental impacts.

In many states lease applicants have found that the opposition is

simmering in the permitting agency itself. While it is rare that an entire public resource agency will be anti-aquaculture, it is not uncommon for one or two individuals to hold up applications for years by losing paperwork, slow-walking approvals or endlessly asking for additional information. Sometimes the best remedy is to have these individuals reassigned to managing the shell-recycling program.

In some communities it has gotten so bad that lawyers are out trolling for clients in aggrieved homeowners' associations, selling themselves as defenders of the commons. One affluent group in Maine has funded a significant public media campaign to falsely suggest that oyster farming will somehow be bad for the state's iconic lobster fishery.

Thankfully, applicants are eventually winning most of these battles. Objectors don't get much traction when their only complaint is that aquaculture operations sully their viewscape, so they often claim interference with other users or predict negative ecological impacts. But thankfully, the science is on our side. Oyster farming has proven ecological benefits, and the Army Corps of Engineers has made it clear that if you can still get from point A to point B—even if you now need to go around an oyster farm—that is not called a "navigation hazard." That is called navigating!

I can't promise that every permit battle will be decided in our favor; some proposals are no doubt ill-advised. But I do counsel patience and



STEVE HELBER/AP

Low tide reveals oyster cages in Virginia Beach, Va. With increasing use of floating gear that's visible throughout every tidal cycle, waterfront homeowners are pushing back to preserve their views—a conflict the local press calls, "the Oyster Wars."

persistence. These traits will serve any farmer well, not only in the permitting phase, but certainly later on as a shellfish grower. In fact, if you're not as stubborn as a mule you might not be cut out for oyster farming.

Recently one of our members related a great story. The names have been changed to protect the innocent, but the narrative is a familiar one. For nearly three years Fred had been anxiously awaiting his permits for a string of OysterGro cages. He kept getting assurances that the permit was coming, so he invested in gear and ordered seed. Even though the permits had still not materialized, the promises kept coming so Fred went ahead and drove some anchors and

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Member Type	Gross Annual Sales	Dues
Grower	\$0 to 50,000	\$100
Grower	\$50,000 to \$100,000	\$200
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Grower	\$300,000 to 3 million	\$1,000
Grower	Over \$3 million	\$1,500
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Permitting

deployed the gear when the seed arrived because he didn't really have a choice.

Next thing you know, a Fisheries Enforcement officer comes knocking with instructions to arrest Fred for illegal aquaculture, and he is supposed to impound all the gear. Fred knows the officer pretty well and he explains the whole situation. When Fred threatens to demand a jury trial on the assigned court date the officer gets cold feet. What if Fred is right and the resource agency is wrong? The officer decides to do some research and discovers that Fred was right all along, and the charges are dismissed.

Fred had also invited some state representatives to come tour his operation, where he told them about the promise of new jobs and economic development. When these same politicians learned about Fred's permit problems, they applied pressure on the resource managers. Suddenly, the folks writing permits are much more careful to ensure that the proper procedures are followed. The next applicant should have a much easier time.

Are there lessons to be learned? Build relationships, ask questions, know the process and stand up for your rights. Be persistent and rest assured that the science and the laws are on your side. Get the politicians and resource managers out on the water and explain the process to them early on. It's a lot easier to set the narrative before the opposition gets involved and convinces them that you are evil.

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Don't miss out on access to our primary conduit for delivering timely news, grant info, tips, answers to growers' questions and more.

It's free for members and it's easy to sign up: just click on the [Join](#) button on [ECSGA.org](#) and follow the directions.

Pro Tips: How To Be a Good Neighbor

At the Virginia Aquaculture Conference held in Newport News in mid-November much of the agenda was directed at mitigating user conflicts and easing tensions between growers and those who would prefer not to look at them. On the first day, a panel of growers listed recommendations to avoid pissing off boaters and waterfront homeowners. Plenty of good ideas were shared, many of which boil down to the concept of trying to view your farm through the eyes of your potential opponents. Following are some suggestions for de-escalating or heading off the oyster wars:

- The appearance of your lease and your shoreside facilities is vitally important. Neat, tidy rows of gear will draw fewer complaints than piles of gear strewn about;
- Be mindful of the odor of drying gear and shell piles. Who is downwind?
- Sign up to serve on conservation groups, harbor management committees, zoning boards;
- Engage with your neighbors, your state reps, and your regulators. Invite them on tours and share some product. Listen to comments and don't argue;
- Never drop trash, zip ties or cigarette butts in the water;
- Use trawl lines for bottom cages instead of dozens of individual buoys;
- Piles of gear on the shore, at the dock or anywhere in sight should be tidy. A little well-placed fencing can go a long way;
- Don't start with an application for a huge lease—it might scare potential allies into becoming opponents;
- Engage with passing boaters, high schools, community groups;
- Implement Best Management Practices, like those developed by the [ECSGA](#) and the [Virginia industry](#), to avoid flashpoints for conflict;
- Limit loud music and colorful language, and especially refrain from running loud machinery early in the morning;
- Work with state and regional aquaculture associations;
- Ask for advice from other growers and extension agents; and
- Keeping your head down is not a valid strategy.



ROBERT RHEAULT

Space-age floating gear on display at the 2019 Virginia Aquaculture Conference. As more growers turn to floating gear, user conflicts with neighbors and boaters who wish they'd just go away are increasing.



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ISSC Wrap-Up

develop a regulatory response. Although we made some progress with proposals that tried to address this issue, I predict it will remain a vexing challenge for years to come.

One of the “wins” we can point to was a rule change saying that states will not be required to close growing areas based on *Vibrio parahaemolyticus* (V.p.) illness reports that come more than 60 days after harvest, or if environmental parameters have changed such that the V.p. risk is reduced. With illness investigations often taking 6–8 weeks to complete, closing these growing areas after such a long wait is more punitive than preventative, since the pathogenic culprits are likely long gone. This should give state authorities more latitude in deciding when to close harvest areas.

Impacts from mooring fields

One of the more significant actions taken by the Conference is likely to present a major setback for growers who operate in the vicinity of mooring fields. The FDA has stretched its interpretation of “structures” in marinas to include mooring tackle, so now states will need to reclassify harvest areas around mooring fields as conditional, restricted or prohibited. In many states this will impose a huge burden on state regulators in terms of water sampling and administrative work. Mooring areas are

defined as areas with more than 20 boats at anchor, and this change has the potential to negatively impact hundreds of growers, despite a complete lack of evidence that these mooring fields are causing illnesses. Many of these areas are used only by day-sailers and center-console outboards, which do not support live-aboards and do not have heads.

Meanwhile, these mooring areas are already designated as “no-discharge zones,” and states have invested millions in pump-outs and enforcement efforts to ensure that boats are not flushing heads in state waters. We believe these current measures are working and we fear that many states will be forced to close waters because they don’t have adequate resources to reclassify all their mooring areas.

Efforts to tighten up the requirements to close harvest areas and force recalls after fewer illness reports were not well received, and those proposals were sent back to committee. Many inferior proposals suffered a similar fate.

Focusing on minutia

Dozens of proposals were floated that would allow the use of new tests to detect harmful algae and to clean up language inconsistencies in the Model Ordinance. Industry members tried mightily to push back on the b.s. and limit new rules that would do little to improve public health. In that vein, we were able to delete references to hand sanitizers from the NSSP, and to strike an old regulation describing appropriate toilet-paper holders in dealer shops.

I find it disturbing that we spent so much time arguing about insignificant minutia while big challenges were ignored. It is inexcusable that 60-80 percent of tracebacks fail to track an illness to a harvest source. If we don’t know the cause of an illness, how can we hope to prevent the next one? Meanwhile, the FDA is wasting our time and limited resources mandating thermometer calibrations and expensive backflow preventers to address hypothetical threats to public health.

Some of the best parts of the ISSC conference are connecting with other growers, learning about different industry practices and building rapport with state regulators. Everyone at the conference goes there with the common goal of reducing illnesses and improving our industry. Working together on these vexing problems builds trust and understanding between the regulators and the industry. I wish I could say the same about the FDA and the CDC, but our relationships there still need work.

Thank You!

If you see any of these industry folks who took valuable time away from their jobs to prepare for and attend the ISSC biennial meeting, please let them know that you appreciate their efforts on your behalf.

Jeff Auger (Mook Sea Farm)

Norm Bloom (Norm Bloom & Son)

Darcie Couture
(Resource Access International)

Greg Dale (Pacific Seafood)

Bill Dewey (Taylor Shellfish)

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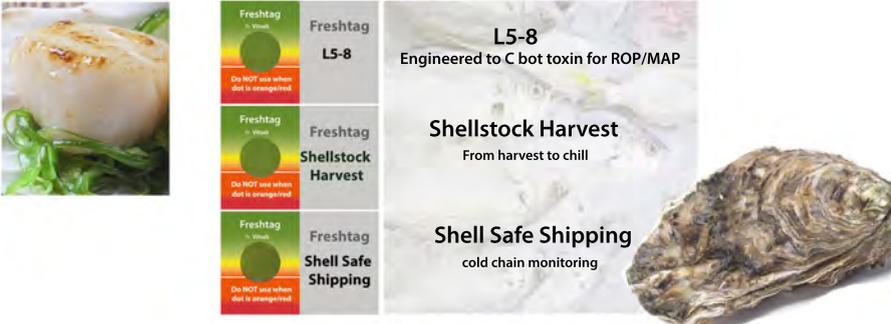
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Does Size Really Matter?

by Robert Rheault,
ECSCGA Executive Director

Recently the Massachusetts Aquaculture Association promoted state legislation that would have allowed transfers of aquaculture licenses “by sale, gift or bequest” to any person or entity originally included on the license. The term “entity” was interpreted by some to mean “corporation,” fueling concerns about how this could lead to a concentration of licenses in the hands of a few wealthy firms. The conflict has raised a number of issues worthy of discussion.

Because Massachusetts is a “Home Rule” state, municipalities are authorized to set their own rules and regulations governing aquaculture development. As a result, some towns have many leases while others have none. Many towns have established maximum lease sizes of 3-6 acres in an effort to ensure that any resident can participate, although it’s questionable whether these small lease sizes even work because growers have been known to get leases in the names of their wives, children, cousins and even their dogs (slight exaggeration).

And while most municipalities have a mechanism for transferring leases to family members, there is no way for growers to sell their leases outright if their kids don’t want to carry on the tradition. Since some municipalities allow multiple people to be listed on a single license, “work arounds” have been devised where one of those listed effectively sells the operation to another person listed on the license. Nevertheless, there is currently no clear process for a grower to sell the business and the accompanying lease, since shellfish aquaculture licenses can not be sold like lobster or tuna licenses.

These sorts of leasing rules have profound impacts on the nature of the industry that develops in an area. For many years, I have been fighting hard against the pernicious social-engineering rules that attempt to pre-define the maximum size of leases. Because I started out years ago with a tiny farm on a shoestring budget, I am opposed to any regulations that would make it harder to start small farms, but it’s clear that **even in states with a few very large farms, small farms continue to be started.** There’s no denying that the economies of scale for larger operations provide significant advantages, not only to these large firms, but also to the smaller farms and the community at large.

It’s unfortunate that these rules are rarely, if ever, based on an economic analysis and consistently fail to take into account the unintended consequences of the limitations they impose on businesses. Let’s look at those consequences.

Data for oyster farms in Massachusetts show that the average value



CHRIS SEUFERT/WELLFLEET OYSTER

per acre is just under \$25K (at a statewide average price of 59 cents apiece that works out to around 42K oysters per acre). Obviously many growers are doing better than that, so it suggests there are numerous underperforming leases. Capping leases at 3 acres means that a typical grower would have gross sales of around \$74K. In an average year that grower is likely to spend \$10-20K on seed, \$10-20K in boat- and truck-related expenses (gas, insurance, maintenance, boat slip), and probably around \$10-20K in gear maintenance and purchases.

These numbers make it clear that when a municipality limits the maximum lease size to 3 acres, annual operating expenses could easily consume half or more of the value of a farm’s gross sales. This would make it impossible to afford hiring workers to help, consigning the small farmer to a lifetime of back-breaking labor lifting and maintaining all manner of heavy, awkward gear. Luckily, Massachusetts provides subsidized health coverage for self-employed paupers, because few of these growers could afford private health insurance.

At this scale of production growers would never be able to invest in the labor-saving devices such as winches, cranes and tumblers that

make it possible to continue farming for more than a few decades before their bodies can no longer handle the wear and tear.

What about lease transferability? If a farmer can’t sell the lease as a package deal (including the gear, the crop, the boat and the entire business) then there is no retirement plan. The boat and the gear have little value if they don’t come with a lease to growing grounds. Essentially we expect farmers to work until their backs give out and then retire with nothing to show for it. If they have been working for peanuts they probably have not been saving for retirement, and as self-employed workers they won’t be collecting much in Social Security, so they will be essentially destitute.

Allowing people to sell their leases means they will be more likely to have access to financing, to invest in their farms, build value and add to their retirement savings. Letting firms buy up multiple leases has a lot of positive economic effects. As operations increase in scale, efficiencies start to kick in. Larger firms have to insure their employees and often offer employee benefits to retain skilled workers. They have the ability to invest in labor-saving equipment, as

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Happy Holidays!

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Does Lease Size Matter?

well as walk-in coolers, refrigerated trucks and ice machines. They are more likely to observe OSHA safety rules, and because they have so much more to lose, they are often less likely to cut corners on regulations designed to safeguard public health.

Larger firms also tend to be more resilient in the face of catastrophe. Let's face it: our crop-insurance options are inadequate, and disaster is one hurricane or disease outbreak away. Most firms can survive a bad year or a crop loss every ten years or so, but if a small farmer has two bad years in a row the prognosis is not good. A larger firm would likely have operations in several growing areas, making it less likely to succumb to catastrophic losses.

Some fear that allowing lease transferability will lead to a concentration of wealth, with only a few big firms dominating the market and preventing small firms from getting started or

from being able to grow and compete. But we have not seen evidence of this happening in states where a few large firms dominate production with multi-million-dollar operations (Wash., Va., Conn., and Me., for example). In these states small farms are starting up every year, and many of them will eventually grow into significant operations.

In fact, the big operations are likely to make it easier for small growers to get started. They support state associations and have staff dedicated to community outreach. They will often help small producers get their product to market, and they can afford to lobby for workable regulations that also help smaller growers.

Another argument holds that aquaculture leases should be preserved for locals, leading many states to put residency requirements on their leases. This was argued extensively in Maryland a few years ago, but regulators eventually came to accept that if an outside firm wants to come in and start a farm in the state, investing

capital in gear and seed, all the jobs and most of the economic development will still accrue to the locals.

Most states own the commons and are constitutionally required to maximize the benefit to the sovereign—the entire population of the state. So which approach maximizes the benefit to the whole state (or town)?

Is it better to have a few large, stable firms paying good wages and benefits, or a bunch of small growers barely able to eke out a living? I may not have the final answer, but to my mind the best aquaculture lease regulations allow both large and small farms to work together in nurturing a vibrant, healthy industry and maximizing the productivity of our limited coastal resources.

I suggest that the decision-makers think long and hard about the consequences of their actions before blithely setting regulations that could make or break such powerful economic engines.

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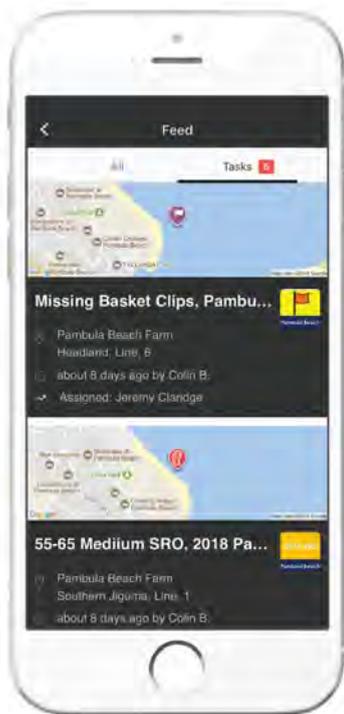
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What We Do For You

by Robert Rheault,
ECSCGA Executive Director

The ECSCGA budget took a big hit this year. Although we work hard to keep the world safe for shellfish farming, a shrinking budget puts much of that work at risk. In the interest of keeping you informed about what's at stake, following is a list of some of our recent achievements and ongoing efforts. We've been working on many of them for over a decade, and though some have already borne fruit, others may require several more years of continued work before we see actual progress.

Back in 2008 we gathered all the East Coast shellfish genetics experts together to form a breeding consortium. This year we got the Senate to allocate funding for two U.S. Department of Agriculture Agricultural Research Service geneticists in the FY20 Senate Agriculture budget. Also, this year the breeding consortium won a \$4.4 million grant from NOAA for five years of genetics research that should allow us to map the functions of many of the millions of oyster genes.

We continue our decade-long efforts to address the regulatory challenges associated with the interstate transport of seed by:

1. working with Rutgers University through a Saltonstall-Kennedy grant to form a team of pathologists, industry and extension folks to develop a GIS-mapping tool that will allow regulators to see where various shellfish diseases have been detected. Regulators should have fewer concerns about seed transfers if pathogens of concern are shown to be already established in the receiving state.

2. developing a voluntary hatchery-certification process that would reduce the need for expensive batch testing of seed for hatcheries that agree to implement best management practices and submit to annual inspections. Shipments of seed into states that accept hatchery certifications would not require batch testing for seed that had never been exposed to unfiltered seawater.

We organized the efforts of three-dozen industry members who attended the five-day ISSC meeting in San Diego in October to ensure that proposed regulatory changes being pushed by the Food and Drug Administration (FDA) and the Centers for Disease Control don't run us all out of business. Our team reviewed over 100 proposals, studied more than 1,000 pages of materials and participated in 15 hours of conference calls to coordinate our work on dozens of committees and work groups.

We have submitted a bill in Congress: HR 4766: *The Shellfish Aquaculture Improvement Act*, exempting



ROBERT RHEAULT

Every year ECSCGA members make the trek to DC and join forces with their compatriots from the Pacific Coast to visit their representatives in Congress.

aquaculture producers from the Merchant Marine Act so they can insure employees under state workers compensation instead of expensive Jones Act endorsements. Growers in many states pay for both types of insurance and still are exposed to potentially crippling lawsuits under the Merchant Marine Act.

Last year we were successful in getting language into the Farm Bill directing the USDA Risk Management Agency to make changes to the Whole Farm Revenue Protection program to accommodate the needs of shellfish farmers. It may take years of work to bring this effort to fruition, but we are optimistic that this program will be much better than the Non-Insured Crop Protection program offered through the Farm Service Agency.

We have been pushing for eight years to restore

trade in molluscan shellfish with the European Union. The FDA assured us that trade would resume this year, but recent snags in international trade negotiations appear to have temporarily derailed progress.

Every year we travel to Washington, D.C., to educate our elected representatives and agency staff about the shellfish aquaculture industry and the benefits we bring to rural economies, sustainable seafood supplies and estuarine ecosystems.

We continue to serve as a point of contact for press inquiries, ensuring that reporters get accurate information about food safety and about our efforts to reduce illnesses.

We responded to several Federal Register requests for comment to ensure that regulatory agencies understand our concerns.

We provide timely and accurate information through our newsletter and Listserv, arming growers with the tools they need to understand the complex issues involved in farming the commons and shepherding raw food through a convoluted value chain.

We connect researchers with industry partners, encouraging them to focus their research efforts on issues that impact us the most.

We have successfully brought pressure to bear on agencies like the Army Corps of Engineers and the FDA to speed regulatory review and avoid crippling regulations that have little bearing on public health or safety.

In short, you need us and we need you. We hope you will continue to support our work by encouraging your friends to join the ECSCGA and by spreading the good word about everything we do for you and the industry.

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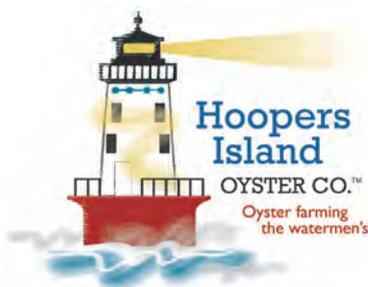
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NSA is looking for members of the industry, government, non-profit and extension sectors to submit abstracts for the special session on *Shellfish Aquaculture Business and Economics* to be held at their annual meeting in Baltimore, March 29 – April 2, 2020.

This is a chance to share what you've learned about topics such as farm profitability, economic impact of shellfish aquaculture, marketing of shellfish products, costs of production, financing, etc.

The deadline for abstract submission is December 15, 2019.

Send abstracts to Matt Parker, mparke11@umd.edu.

For more info visit www.shellfish.org/annual-meeting

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Safely Shipping Shellfish: Lessons from U.S. Oyster Supply Chains

by Bobbi Hudson, Pacific Shellfish Institute
David Love, Johns Hopkins Center for a Livable Future
Robert Lane, Virginia Seafood Agricultural Research & Extension Center

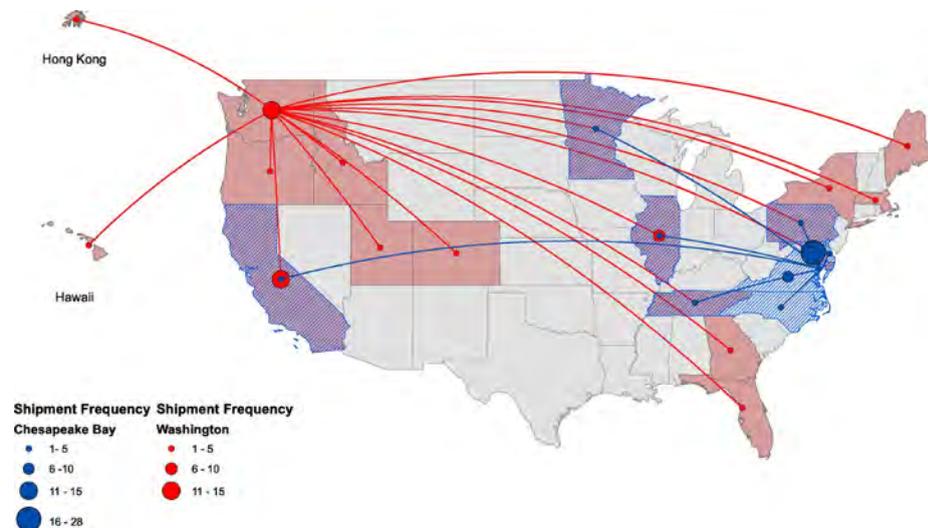
Shellfish harvest and post-harvest processing have been the focus of research and policies to reduce *Vibrio* risks. However, other parts of the supply chain also play a role in keeping shellfish safe for human consumption. To better understand supply chains—and generate what we hope is useful information for the shellfish industry—we spent two years working with producers in the Chesapeake Bay and Washington State’s Puget Sound and Pacific coast, tracking oysters from dock to plate. At each farm we visited, we slid coin-sized temperature sensors inside freshly harvested oysters, and taped sensors to the outside of packaging. Over the two-year study, we tracked 125 oyster shipments from farms to their final destination.

Results indicate that a box of raw oysters is handled by two to seven companies. Most farms in our study sell to wholesalers that in turn coordinate distribution with freight forwarders, commercial

trucking companies, and commercial airlines, shipping products over hundreds to thousands of miles. A few shipments in our study traveled more than 6,000 miles to Hong Kong with the help of import/export companies.

Combining the supply-chain maps and temperature-sensor data revealed how well the supply chains performed for temperature control. As readers of this article undoubtedly already know, the Interstate Shellfish Sanitation Conference criteria for shellfish is an internal temperature below 50°F and a refrigerated environment below 45°F. These temperatures prevent or slow the growth of pathogens and spoilage microorganisms. Our study revealed that oysters were held at 39°F on average, which is well below the maximum allowable temperature.

Generally, as oysters moved down the supply chain, they became colder and there was less varia-



Oyster shipments tracked from Chesapeake Bay (blue, n = 63) and Washington State (red, n = 63). In: [Love et al. 2020a](#).

tion in temperature. Comparing regions, Washington State producers and freight carriers maintained oysters at colder temperatures than their counterparts in the Chesapeake Bay. But once oysters reached the wholesale and retail level there were no differences in product temperature for Washington State and Chesapeake Bay oysters ([Love et al. 2018](#), [Love et al. 2020a](#)).

Unfortunately, we also found that nearly one in five shipments we tracked went above the regulated temperature criteria for an hour or more. The average amount of time

those boxes spent out of temperature compliance was 2.5 hours, and the maximum temperature any oyster reached was 58°F. (Ed note: the FDA’s [Vibrio parahaemolyticus Risk Assessment](#) estimates that the doubling time is 7 hours at 58°F.)

While producers and freight carriers experienced the most time-and-temperature issues, no part of the supply chain was free from occasional spikes in temperature. We saw several types of time-and-temperature abuses, including faulty mechanical refrigeration units,

— Continued on page 15

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— Continued from page 2
Offshore Mussel Farms

The condition of the mussels during both spring and summer was actually better than the range reported for Prince Edward Island, a well known mussel farming area in Canada. These experiments groundtruth the environmental analysis, confirming that mussels perform well offshore of Cape Ann, Mass., at the recommended depth.

“There is great potential for sustainable farming of shellfish in New England federal waters,” said lead author Darien Mizuta.

This is the first study to use historical environmental data to

examine a large area of the Northeast U.S. coastal-shelf ecosystem for aquaculture suitability. Mizuta and Wikfors also recorded some of the first measurements of mussel feeding performance in offshore New England waters.

Although this study focused on locating ideal environmental conditions for growing mussels, it did not consider social perceptions, legal aspects or use conflicts in the offshore space, which also affect the decision of where to site a farm.

Filling a critical research gap, these findings contribute to the knowledge base required for growers to invest in offshore aquaculture in New England waters.

40th Milford Aquaculture Seminar Courtyard by Marriott, Shelton, Conn. January 13-15, 2020

The seminar opens Monday, Jan. 13 with a poster session and welcoming event, followed by two days of technical sessions, mostly focused on shellfish aquaculture.

Early room reservation discount rate of \$119 ends December 14.

For more info visit www.fisheries.noaa.gov/aquaculture/milford-aquaculture-seminar

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— Continued from page 13

Safely Shipping Shellfish

temperature abuse on airport runways, product left on loading docks, and failure to refrigerate boxes upon arrival at restaurants. Two businesses in the study accounted for one-third of all temperature abuse. While these may seem like outliers, temperature abuse anywhere in the supply chain can reflect poorly on the entire supply chain and on the industry as a whole.

When one stage in the supply chain experiences temperature abuse it tends to ripple through the system, affecting downstream businesses. Supply chains with more connections are also more vulnerable to time-and-temperature abuse, and some modes of delivery are inherently riskier than others ([Love et al. 2020b](#)).

Air cargo shipments had the highest rates of time-and-temperature abuse. To guard against spoilage and to control pathogen growth, airlines ask that shippers pack boxes to withstand no refrigeration for up to 48 hours for domestic flights. Although oysters can be shipped safely by air, shippers should use insulated packaging with high R-values, and include plenty of frozen gel packs.

We recommend that businesses handling shellfish take the following actions:

- ❑ Verify that Hazard Analysis and Critical Control Point (HACCP) plans are being followed and working appropriately to control *Vibrio* bacterial growth caused by time-and-temperature abuse; and
- ❑ Use temperature sensors or time-and-temperature indicators (TTIs) in your facility, and in shipments one-up and one-down in your supply chain. Temperature sensors and TTIs can verify that procedures and practices are working properly.

We also recommend developing guidance for the shellfish industry regarding best practices for domestic and international air-freight shipments.

This project was supported by the NOAA Saltonstall-Kennedy Grant Program (16GAR008). For more details, please see our free online peer-reviewed articles and extension factsheets.



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Swedish company Vitsab sells Time Temperature Indicators (TTIs) that show how long product has been exposed to temperatures outside a set range during shipping. The tab is white before activation, turns green when activated, yellow as it nears the freshness endpoint, and then turns red once it reaches the endpoint.

Lane, R. M., Love, D. C., Kuehl, L. M. and Hudson, B. 2019. *Application of Time-Temperature Indicators and Time Temperature Data Loggers in the Seafood Industry*. Virginia Cooperative Extension publication FST-345NP. www.pubs.ext.vt.edu/FST/FST-345/FST-345.html

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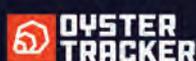
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