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Living Shoreline

Green Fish Farming

Working Waterfronts

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Cover: Spot are transferred to a customer's truck at Mid-Atlantic Aquatic Technologies in Quinby, VA. Photo ©Margaret Pizer/VASG

IN THIS ISSUE

Lessons in Green Fish Farming.....2

One Eastern Shore aquaculture operation is pioneering the use of alternative energy solutions in Virginia fish farming—and hoping to set an example for other marine businesses in Virginia and beyond.

Building a Living Shoreline.....6

This fall at Deltaville Yachting Center, volunteers gathered to help the owners find a more natural way of combatting coastal erosion. See how they did it in this photo-essay.

Working Waterfronts and Waterways.....8

Coastal populations are booming, making access to the water a national problem. Virginia Sea Grant is collaborating with several other programs to bring together stakeholders from communities around the country to share local solutions to preserving public access and working waterfronts.

News from the Point.....13

We bring you the latest news from Virginia Sea Grant, including our most recent Knauss Fellows, newly funded research projects, and an interview about the Virginia Game Fish Tagging Program.

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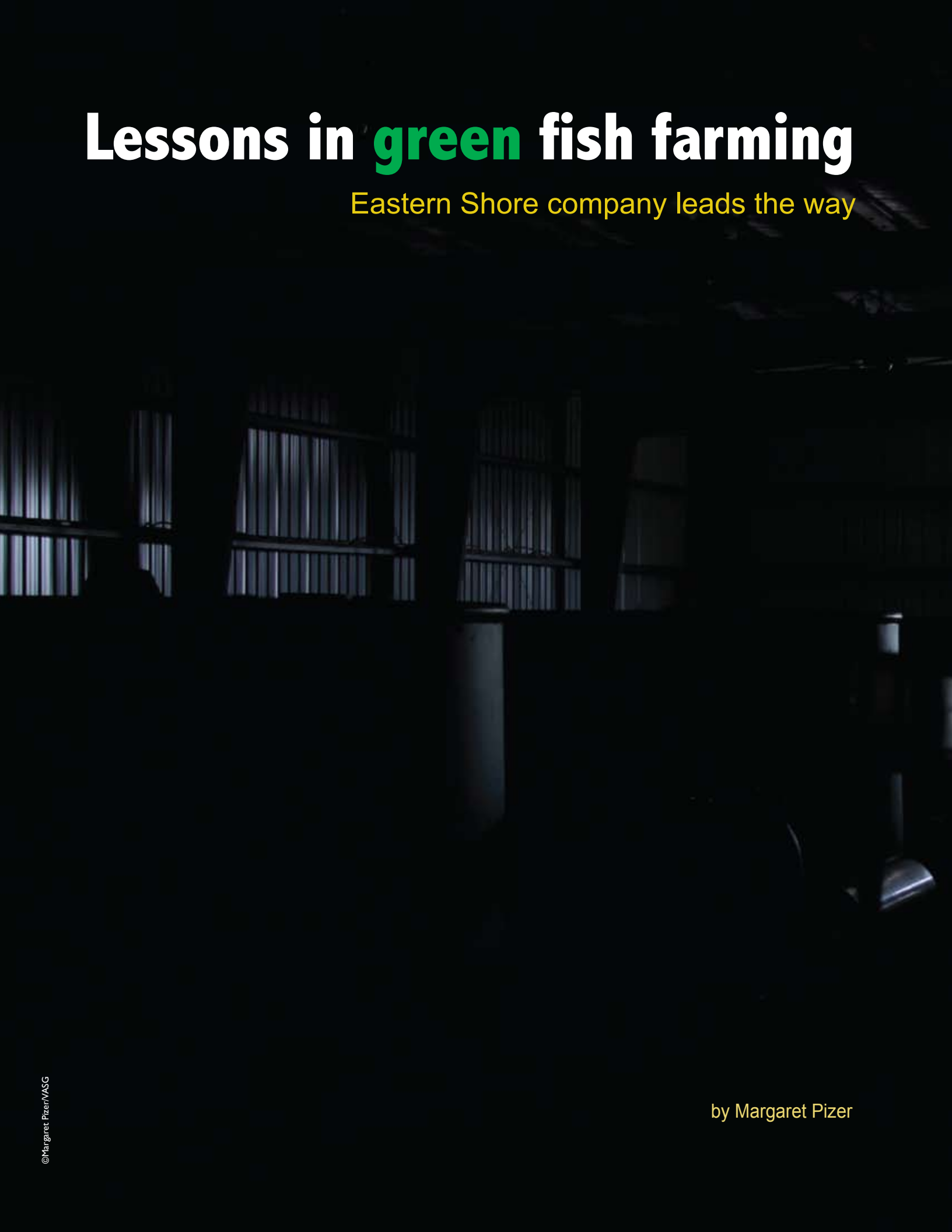
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Lessons in **green** fish farming

Eastern Shore company leads the way





On a sweltering humid day last August, it was all hands on deck at the Mid-Atlantic Aquatic Technology (MAAT) fish farm in Quinby, VA. Owner Clarke Morton inserted a hinged screen into one of the farm's 7,000-gallon round tanks and used it to corral thousands of 5-inch-long spot (*Leiostomus xanthurus*) into a corner while farm manager Chris Bentley and hatchery technician Idris Risky used a net to scoop the fish into buckets. They carted the buckets of fish to a customer's pickup truck and emptied them into plastic barrels that

he had rigged up in a trailer for the drive back to Atlantic City.

Although the late summer heat made it hard to imagine, heating the hundreds of thousands of gallons of water circulating through the facility's tanks is a problem for the farm. Propane is a significant expense during the winter months. Thus Morton and Bentley were excited to show off the newly installed solar thermal water heating system. This January, the system became fully operational, and in the first month it was able to fulfill all of the heating requirements for MAAT's



Previous page: Staff load fish on to a customer's trailer at the MAAT fish farm in Quinby, VA. **Above:** Clarke Morton moves a netful of croaker into a tank.

15,000-gallon system—at an estimated savings of about \$20 a day in propane. Over the course of an entire winter, this should amount to savings of at least one to two percent of the fish farm's total operating budget.

Launching an Aquaculture Business

MAAT's system is the fruit of a long collaboration between Morton and Virginia Sea Grant staff at Virginia Tech's Virginia Seafood Agricultural Research and Extension Center (VSAREC) and Virginia Institute of Marine Science (VIMS). In fact, Morton began interacting with Virginia Sea Grant extension staff even before he chose a site for his facility in 2002.

For Morton, who practices emergency medicine in Newport News, fish farming allows a unique melding of his concern for the environment with his interest in human health—mixed in with more than a dash of entrepreneurial spirit.

"I wanted to start a business that actually helps the environment," says Morton, who was drawn to fish farming as a way to sustainably meet demand for seafood and provide people with fish-based omega-3 fatty acids that are important for human development and health.

With these goals in mind, Morton sought advice and help from Virginia's various extension programs to start a finfish aquaculture business. He credits VSAREC's Mike Schwarz with helping him design the MAAT building, a large metal barn with several smaller greenhouse-like structures inside. A setup developed by VIMS's Mike Oesterling served as the model for Morton's seawater system. Market surveys conducted by Oesterling also helped Morton choose the species of fish he'd grow.

"I went to a conference that Mike Oesterling put on, and he spoke about spot as live bait and entering the bait market," says Morton. "He was convinced that spot was the best bait to grow based on his market surveys." So Morton decided to use the spawning techniques and culture systems developed by Oesterling at VIMS to give fish farming a try.

Energy Savvy

At the same time, Morton began collaborating with Bob Lane of VSAREC on energy efficiency and alternative energy projects. Before the facility was built, Lane helped Morton plan for energy expenditures by performing an energy audit. An energy audit analyzes a facility's use of oil, gas, electricity, or other energy sources to identify ways to reduce costs. Lane's initial energy analysis prompted Morton to think about ways to incorporate alternative energy into the facility.

The first source of alternative energy that MAAT pursued was wind energy. Using the results of a later energy audit Lane performed, Morton completed the paperwork to have an anemometer installed at the MAAT facility. The instrument, the result of a collaboration between the Virginia Department of Mines and Minerals and the Virginia Wind Energy Collaborative based at James Madison University, was mounted on a 50-meter tower to measure the potential for wind energy. Measurements showed that wind rates are not high enough at MAAT to make the

use of wind energy feasible at this time. Nevertheless, the project has provided baseline data that may help Morton's farm or other farms on the Eastern Shore to use wind energy in the future.

"From what I understand, you need to get [the wind turbines] higher to get out of the way of the barrier islands," explains farm manager Bentley. That would necessitate wind turbines that would be higher and larger than is currently feasible for MAAT. "We're leaving [the anemometer] up for a second year for data collection for some other companies that are interested . . . because it's valuable data for the whole area," he says.

Heating Up

MAAT's most recent energy audit was aimed at determining which renewable technologies would give the facility the best return. Solar thermal seemed to be a natural choice since MAAT's spot must be maintained in water at about 75°F year round. Lane analyzed the amount of energy that a solar thermal system could generate for the farm and determined that "It looked feasible with a reasonable payback period."

Morton and Bentley then learned about a variety of incentives that would help pay for the system. "With the grants, the whole project was essentially paid for," Morton explains. "The thing ended up costing me about \$376 instead of \$67 to \$70 thousand."

The system uses solar panels on the facility's roof to heat water and then stores the hot water in a large holding tank. In addition to offsetting heating costs, the solar thermal system should help MAAT maintain their fish at warmer and more constant temperatures through the winter, which should lead to faster growth.

Morton and Bentley are already looking forward to the next improvement. They hope to evaluate whether the solar thermal system could be used to cool the facility in the summer through adsorption cooling.

Energy economy and smart planning have been a big part of MAAT's success, enabling it to grow from an output of 125 fish in 2006 to this year's output of more than 45,000 spot.

"Through the different people who have helped him, Clarke has put together a program that has a low overhead," says Lane. "MAAT's en-

Virginia Fishery Resource Grant Raising Flounder for Sushi

In addition to growing spot and croaker for the bait market, MAAT staff are investigating methods for growing flounder for the live sushi market. These fish would be caught at relatively small size and then grown up to market size and sent live to sushi restaurants. A major impediment to this process is that flounder come into the aquaculture facility carrying diseases or parasites such as sea lice, and thus suffer poor health in the tanks. Clarke Morton and his staff are researching targeted methods to treat reduce or eliminate sea lice infections. "It has to be a USDA approved treatment because these are food fish," explains Morton. "We don't want to just hit them with everything in the book either. We want to try to target the pathogen."

In support of this research, Morton was one of eight recipients of Virginia Fishery Resource Grants in 2010. The Virginia Fishery Resource Grant Program awarded more than \$180,000 to commercial fishing, aquaculture, and processing companies last year. The program provides Virginians who are active in the fishing, aquaculture, or processing industries with funds to test their ideas for improving and protecting fisheries. The funds are administered annually by Virginia Institute of Marine Science in partnership with Virginia Sea Grant.



©Margaret Pizer/MASG

ergy use is one of the lowest in the industry for the number of fish that they're growing, and that is due to the way they built [the facility] and the energy analysis that we did."

Lane thinks that many aquaculture and seafood businesses could benefit from following in Morton's footsteps. He cites a few other examples of alternative energy projects in Virginia's aquaculture industry, including a trout farm that is researching hydroelectric turbines. The Department of the Interior has also expressed interest in implementing some of MAAT's practices at fish farms on Native American reservations.

"People tend to think more about, 'How do we get product through our plant; that's where our dollars are,' and that's what seems to take precedence," says Lane. "But Clarke's beginning to see the rewards of making those energy analyses up front and then buying the right equipment." ✓



BUILDING A LIVING SHORELINE

When shoreline erosion strikes, coastal property owners are left with two options: Watch as the force of future waves and storms drags more and more of the shoreline away, or do something about it.

Onna and Lew Grimm, owners of the Deltaville Yachting Center (DYC) on Broad Creek, just off the Rappahannock River, decided to stabilize their shore with a living shoreline. The ground between the marina's C and D docks has disappeared at an alarming rate since the 1980s. This little piece of land facing almost perpendicular to the creek channel has taken a beating from hurricanes, n'oreasters, and everyday wave energy, the shore had eroded more than 3 feet since the 1980s and continued to retreat each year.

Environmental stewardship is very important to the Grimms. Their marina is one of Virginia's 65 Clean Marinas, and because it plays host to a variety of wildlife, Onna wanted to create a living shoreline that could provide some habitat for the otters and heron that already visit. So the Grimms contacted Hammer Time Marine, Inc., which drew up plans and helped obtain a permit for the job. Because of costs and the uncertain economy, the Grimms put the project on hold until Friends of the Rappahannock offered some financial support and human power to get the project started.

Here's how DYC, Hammer Time, and Friends of the Rappahannock got the job done. Want to see more? Check out a video about the project at www.YouTube.com/VirginiaSeaGrant.

Photos ©Margaret Pizer/VASG, Janet Krenn/VASG, Anne Smith/VASG, Gabriella March/VASG.



1 This aerial photo of the shore between the C and D docks was taken around 1980. The blue line approximates the position of the shoreline in 2010, before this project began.



2 On September 1, 2010, 25 volunteers from Friends of the Rappahannock and Fish and Wildlife Service (led here by Michelle Meredith of Hammer Time) unloaded eight coir logs and laid them along the existing shoreline. The 20-foot-long logs were made in India from coconut husks.



3 Volunteers secured the coir logs in place by pounding in stakes and tying down the logs with twine.



4 Hammer Time staff filled the space between the coir logs and the eroded bank with sand.



5 On September 16, 2010, volunteers returned to plant marsh grasses.



6 When the work was done, the shoreline between C and D docks looked like this.



7 Five years from now, the coir logs will have decomposed, and the marsh grasses will have spread, creating a natural, stable, living shoreline, like the one shown here, planted several years ago at the Deltaville Maritime Museum.

Working waterfronts

From local success to a national movement



©Janet Krenn/VASG

and waterways

by Janet Krenn



The recent recession may have caused a dip in coastal economies and temporarily slowed demand for coastal access, says Charlie Colgan, but he predicts that in the long-run, “New demands on the waterfront are emerging. The coast will be more crowded than ever.”

This wasn't good news to the audience of the Working Waterways and Waterfronts (WWWWF) Symposium held in Portland, ME, in September. The Portland Symposium was the second installment of the 2007 WWWWF Symposium held in Norfolk, VA, which kicked off a national discussion between commercial, recreational, and government groups interested in preserving coastal access and working heritage against a trend of coastal access loss.

“The 2007 Symposium tried to identify and describe the problems and to find common ground between diverse water-dependent industries,” says Natalie Springuel, Maine Sea Grant Extension Agent and Maine's WWWWF Symposium organizer. “The 2010 conference focused on how we address the challenges that working waterfronts are facing. What solutions are working?”

In addition to sharing information, the Symposia have provided those with a stake in coastal access an opportunity to discuss local solutions to water access loss and possibilities for working together nationally or regionally. These discussions come at a time of steep decline in public access to the coasts.

The concern for Symposium attendees was clear: How could they provide opportunities for multiple-use waterfronts today and into the future?

Determined to end on a positive note and inject an air of possibility into the room, Colgan, who is Chair of Community Planning and Development at the University of Southern Maine, showed a picture of a sign that read “Fish'n Optician Lobsters & Eyeglasses.”

“We should never underestimate the depth of creativity,” Colgan says. “We need to find and recognize what those creative uses are to make the best use of the limited space we’re dealing with.”

Coastal Crowding

One reason coastal access is becoming scarce is coastal crowding caused by a combination of population growth, property value increases, and sea level rise.

Coastal populations are booming nationwide, according to the most recent U.S. census data. Population in coastal counties increased an average of 48% from 1999 to 2003, and before the economic downturn, the trend showed no sign of slowing. More than 2.8 million new housing permits were issued in coastal counties throughout the nation over the same five-year period.

Previous Page: Fisherman's Pier in Portland, ME.
Below: Fish'n Optician sign, in Saco, ME.



©Charlie Colgan/USM

Currently, Virginia ranks in the top five states for population increase. The population of coastal counties increased by nearly 50% from 1980 to 2003, and more than 180,000 building permits were issued for single-family and multifamily residences in Virginia's coastal counties from 1999 to 2003.

While populations increase, Virginians also continue to lose access to the coast due to sea level rise. By 2050, VIMS researchers estimate that sea level will be nearly one foot higher than today's levels. This could result in the loss of some access points and the increased pressure of more traffic at others.

“These are not isolated issues,” says Springuel, who coordinated surveys of water access issues in 2007 and 2010. “Loss of access is happening in different ways in different parts of the country.” With population increase comes higher prices for property, and when this happens, some locals get priced out of their communities.

Economic Monotony

Springuel notes that as citizens lose access, economic diversity is lost. A common theme that ran through the 2007 survey was the conversion of traditional working waterfronts to other uses.

“The concerns folks are having are related to year-round economic vibrancy of the community,” says Springuel. As communities lose economic diversity and become seasonal attractions, residents may need to leave the community for part of the year to find work.

Yet diversity itself also spurs complications on the waterfront. Before the 2007 Symposium, commercial and recreational groups saw each other as competitors for limited access points. Bringing these groups together in the same room with a willingness to work together was a first step to bringing the working waterfronts dialogue to the national level.

“I can't overstate the importance and strategic significance of partnerships between commercial and recreational fisheries groups,” says Tom Murray, organizer of the 2007 Symposium and Marine Extension Leader for Virginia Sea Grant. Because of its standing in the community, notes Murray, Sea Grant has the ability to bring people together without an agenda and to see all sides

of the situation, a position that has empowered stakeholders to work together at the local and national levels.

“Virtually every water-dependent interest was present at the Norfolk meeting,” says Murray. “What came out of that meeting was a consensus definition that was general enough to include all of the players and could be applied across the country, but it was specific enough to really address the common problems all groups are facing.”

Local Efforts

This year’s Portland Symposium revealed a silver lining behind looming cloud that is coastal access loss. Because the challenges are similar nationwide, solutions to local problems can be transferred to other areas facing similar challenges. This means that one successful effort could form a model for others throughout the country.

Sea Grant programs nationwide have been successful at providing science-backed information to develop new tools, provide information, and facilitate local and state efforts that have the potential to be translated again and again among states.

For example, Florida Sea Grant has contributed to developing science-based methods, spatial data, and model policies to support waterway access planning. One such tool, the Regional Waterway Management System, analyzes navigation patterns of commercial and recreational boats and can help decision makers prioritize waterway dredging and maintenance based on use (see Florida Sea Grant’s webpage, <http://bit.ly/eslfr>).

In other cases, one Sea Grant program becomes a model for others. Maine Sea Grant developed an online clearinghouse of information on legal and policy tools for property owners, public interest entities, and recreational users to address local coastal access issues. The website, *Accessing the Maine Coast* (www.accessingthemainecoast.com), was so successful that it’s being used as a model by five other Sea Grant Programs, including Virginia’s (see sidebar on p. 12).

Without anticipating it, North Carolina Sea Grant created a model for implementing state-wide change. As the leader of North Carolina’s Waterfront Access Study Committee, Sea Grant organized a study of working waterfronts. The



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results of the study prompted the state to authorize \$20M to protect waterfront diversity. This effort has helped guide other programs, such as Washington Sea Grant, as they lead the West Coast Governor’s Agreement on Ocean Health.

Amory’s Seafood in Hampton, VA.

National Attention

“Although coastal access is a local issue, the coast is the gateway to federal resources,” says Murray, pointing out that the federal government has jurisdiction of the oceans from the edge of state waters to 200 miles out. “Without access, we’re not deriving the value of these federal natural resources. From an individual perspective, without access to the water, we can’t enjoy it.”

For these reasons, many supporters of WW-WWF and attendees of the Symposium would like to see more national support backed by federal dollars.

Since the 2007 conference, working waterfronts have gained some traction on the national level. Representative Chellie Pingree (ME) is credited with getting the definition of working waterfronts, generated during the Norfolk Sym-

Virginia's Working Waterfronts

Virginia Sea Grant works to provide science-backed information to help Virginia's coastal communities and individuals plan for the future. When it comes to the issue of working waterfronts, here are some examples of how we've helped gather and deliver information about Virginia's coasts:

- Accessing the Virginia Coast Website (www.VirginiaCoastalAccess.net) went live last fall and received a 2010 Recreational Boating Access Award. The website, based on the Maine Coastal Access Website, acts as a clearinghouse of information on legal and policy tools for landowners, waterfront users, and government officials.
- Study of demand for access in the Mathews Courthouse area is planned for 2011. The study will help the local community weigh the value of dredging Put-In Creek, which has been silted in due to a nearby water treatment plant, to attract recreational boaters to the Courthouse downtown area.
- Fish and Wildlife Service (FWS) Boating Infrastructure Grant (BIG) applicants from Virginia have been the most successful of any other state, and the FWS credits the success to the support, training, and guidance provided by Virginia Sea Grant's Marine Extension Program. BIG grants go toward providing new or enhancing existing boating facilities for transient boaters.
- Build-out Analysis of Lancaster County (<http://bit.ly/gFqptT>) graphically depicts how the county could look in the future if land was developed to the maximum extent under 2005 zoning regulations.



posium, recognized on the federal level. The definition passed the House as an amendment to the National Flood Insurance Reauthorization last summer, with support from all Virginia districts except the 6th and 7th. (The bill is still awaiting action in the Senate.) More detailed legislation has been slow moving.

Current issues involving coastal access aren't addressed in federal legislation. The nearly 40-year-old Coastal Zone Management Act (CZMA) of 1972 loosely refers to a federal commitment to "preserve, protect, develop, ... and restore" the nation's coasts, but it doesn't cover access, coastal use planning, working waterfronts, or other modern issues facing the nation's coast,

making CZMA in its current form weak at best in the eyes of many.

"As important as working waterfronts are," Pingree said at the Symposium, "they don't receive the same support as land conservation or historic preservation."

Yet that hasn't stopped Pingree from proposing the "Keep America's Waterfronts Working Act," cosponsored by Virginia's Congressmen Gerald Connolly (11th District) and Rob Wittman (1st District). The Act, currently in the committee stage, would amend CZMA to include the working waterways and waterfronts issue and create a funding pool to support coastal states to preserve or expand access. In the meantime, Representative Frank Pallone

(NJ) proposed the "Coastal Jobs Creation Act of 2010," cosponsored by Virginia's Congressmen James Moran (8th District), Robert Scott (3rd District), and out-going Congressman Glenn Nye (2nd District). Also in the committee stage, this Act would provide funding for coastal jobs that promote economic and environmental sustainability.

Despite the local successes and the ongoing work on the national level, the 2010 Symposium ended less with closure than with a call to arms. By the last day, attendees were teeming with ideas for next steps. Suggestions spanned everything from an online database of proven methods and tools for dealing with access loss on the local level to organizing a lobbying effort to reach the Federal government.

For Sea Grant programs across the country, this means continuing to provide information to their local constituents and potentially helping develop an online database of best practices. Other groups, such as Maine's Island Institute, may consider helping to organize a coalition.

It is clear that attendees of this second WW-WWF Symposium see a long road ahead. As Pingree says, "The momentum comes from this group working together. It's certainly a necessary and good start, but we're not done yet." ✓

NEWS FROM THE POINT

©Janet Krenn/VASG



Susanna Musick works with a volunteer tagger to catch and tag a red drum.

Taking the Reins of the Virginia Game Fish Tagging Program

By Susanna Musick

Marine Recreation Specialist Jon Lucy retired in June after 38 years of service with VIMS and the Marine Advisory Program. Working with Claude Bain of the Virginia Marine Resources Commission (VMRC), Lucy cofounded the Virginia Game Fish Tagging Program. This angler-assisted research program trains recreational fishermen to collect scientific data about the fish they pursue. As Jon's successor, I joined him on a tagging trip in November on the Elizabeth River. We had a spectacular day for fishing and succeeded in tagging more than a dozen fish. I took the opportunity to ask Jon about his experience with the tagging program.

SM: Why do you think anglers participate in the program?

JL: [They're] usually people who fish a lot and are curious about where the fish they catch go within a fishing season and from season to season. Serious anglers already have a feel for the patterns of fish they target...a basic understanding of the dynamics of the fish. The tagging program gives them concrete information about the fish.

SM: What is the most important thing we can learn from the program?

2011 Research Projects

Twelve projects researching Virginia's coastal and marine environments will receive financial support through Virginia Sea Grant's research program. The funding totals \$535,899, with about \$192,000 supporting graduate students, \$233,000 supporting preliminary investigations, and \$111,000 supporting large-scale research.

Clam Aquaculture and Movement of Nutrients

Virginia leads the U.S. in aquaculture production of the hard clam, *Mercenaria mercenaria*. Iris Anderson, Mark Brush, and Mark Luckenbach of VIMS will study the movement of nitrogen within and around clam beds to better understand the effects of intensive clam aquaculture on Chesapeake Bay habitats. This information will help clam farmers optimize clam production and inform decision makers about how and where to allocate space and resources to clam farming and competing uses.



©USFWS

Mapping Important Areas for Struggling Turtles

In Virginia, the diamondback terrapin (*Malaclemys terrapin*) is listed as a species of "very high conservation need" based on threats from nest predation and drowning of adult terrapins in commercial-style crab pots. Donna Bilkovic and Kirk Havens of VIMS and Randolph Chambers and Matthias Leu of the College of William & Mary will use information about the natural features of habitats to map likely diamondback terrapin habitats and study the overlap of those areas with threats to turtles, such as crab fishing. The results will allow resource managers to identify areas where terrapins are most likely to encounter threats and to establish targeted conservation efforts in those areas.



Understanding Predators on Juvenile Bay Scallops

Bay scallops haven't been found in Virginia's bays for more than 80 years. An ongoing effort to restore scallops to Virginia's bays began in 2009. These efforts have been hampered by low survival rates of juvenile scallops; however, little is known about their predators. This grant will support a student working with J. Emmett Duffy, Robert Orth, and Mark Luckenbach of VIMS to study what eats bay scallop juveniles, both in the field and in the lab.

Predicting Success of Young Flounder and Bass

Fish species such as striped bass and summer flounder can show remarkable fluctuations in abundance from year to year. The roots of these fluctuations can be found in annual differences in the success of spawning and survival and health of young fish. This grant will support VIMS Ph.D. student Ryan Schloesser's work with Mary Fabrizio. Schloesser will measure the lipid content of young striped bass and summer flounder picked up by the VIMS trawl survey in different parts of Chesapeake Bay. This information will be used to help improve the methods that fisheries managers use to measure the success of cohorts of young fish and predict the future abundance of adult fish.

Preventing Shellfish-borne Disease

Both adenoviruses and noroviruses can be released from wastewater treatment plants, potentially contaminating shellfish and causing gastrointestinal illness in people who eat the contaminated shellfish. However, routine and reliable methods to measure the presence of norovirus in water have not been developed. This grant will support a student working with Howard Kator and Kimberly Reece of VIMS to explore whether contamination with adenovirus indicates the presence of norovirus

JL: First, anglers can collectively produce usable data of significance for recreationally important fish species.

Second, it gives the Virginia angling community a sense of getting something back for their saltwater fishing license fees—and that's probably why we've been able to keep interest in the program.

Third, the program has provided data for management of flounder. The data have also been used for better management of tautog, red drum, and speckled trout (in North Carolina).

SM: Do you have a favorite species of game fish?

JL: Spotted seatrout! *Cynoscion nebulosus*...that rascally fish has given me gray hair. Next would be puppy drum because I have learned to catch the suckers, and I can stick a tag in them in a flash!

SM: What has been the most rewarding part of the tagging program?

JL: The best part has been being a cooperator with a state agency (VMRC) on an angler-assisted tagging program that has proven to accomplish the objectives we hoped to achieve. It has been extremely gratifying to work and interact with some of the behind-the-scenes leaders in Virginia's angling community and experience the quality of people in the program. It's also allowed me to quantify interest from the angling community. I've been impressed with the time and interest shown by anglers in the program because tagging takes time away from catching fish. (You don't have your hook and line in the water as often.) Anglers have told me that being in the tagging program has helped them learn to fish better and be more consistent in their fishing effort, and I would agree with them.

Susanna Musick, a native of Gloucester, Virginia, joins the Marine Advisory Program after working as head of the Ascension Island Government Conservation Department. In this role, she managed multiple research and education programs about sea turtles, sea birds, land crabs, marine mammals, and recreational fishing.

Second Annual Project Participants' Symposium

About 100 Virginia Sea Grant researchers, staff, and partners gathered in Richmond on February 2 to share resources and experiences relating to their work with VASG. The symposium was followed by the Virginia Seafood Council's annual Seafood and Wine Reception. VASG director Troy Hartley's "State of Sea Grant" report can be viewed online at www.YouTube/VirginiaSeaGrant.

Five Virginia Students Begin Terms in D.C. as Knauss Fellows

This February, five Virginia graduate students began serving as 2011 Knauss Marine Policy Fellows. Established by the National Sea Grant College Program in 1979, the Dean John A. Knauss Fellowship matches outstanding graduate students from around the nation with hosts in legislative or executive offices in Washington, D.C., for a year of immersion in marine policy.

“This is a highly competitive national program,” says Susan Park, Assistant Director for Research at Virginia Sea Grant, which administers the Knauss Fellowship application process for Virginia’s students. Virginia’s applicants secured more than 10 percent of the nationally available Fellowships, says Park. “No other state had more successful applicants; that says a lot about the qualifications of these students.”



Anna Huntley Coffey will work as Policy Specialist for the Department of Energy’s Water Power Program. Coffey studied population dynamics and disease in blue crab as a masters student at VIMS.

“I am looking forward to working with [the Department of Energy] and learning more about and helping to

break down some of the barriers facing the progress and implementation of renewable wave and ocean thermal technologies,” Coffey says.

Through her Knauss Fellowship, Coffey hopes to gain a better understanding of environmental policy, “which will help me to eventually produce research with greater potential to have a positive impact.”

Abigail Graefe will spend her Knauss Fellowship as a Policy Liaison to the Oceanographer of the Navy. As a masters student in sustainable environmental resource management, Graefe split her time between James Madison University and the University of Malta. Graefe’s position will offer exposure to international environmental issues, something she has experienced through her graduate training and is looking forward to continuing in her career.



After her Knauss experience, Graefe hopes to pursue a career in international science education and outreach.

contamination in local estuarine waters and shellfish. If a correlation exists, adenovirus can be measured as an indicator of norovirus contamination.

Using the Fish Food Web to Plan Ahead

Ecosystem-based fisheries management incorporates information about multiple species, their habitats, and their interactions into a more comprehensive and accurate system for keeping fisheries sustainable. This grant will support VIMS Ph.D. student Andre Burchheister, working with Robert Latour, to analyze extensive fish dietary data collected by the Chesapeake Bay Multispecies Assessment and Monitoring Program since 2002. Burchheister’s analysis will determine the food web relationships between different fish species and allow examination of the effects of environmental factors such as fishing, weather, and food availability on fish species and their interactions.



Knowing Where the Seagrass Grows Greener

Scientists have determined the minimum amount of light required for seagrass to grow. However, they don’t yet know the effect that various dissolved particles have on water clarity and seagrass growth. This information could help seagrass restorers to refine the tools they use to determine plant placement and monitor the plants’ progress. This grant will fund a University of Virginia (UVA) graduate student to work with professors Karen McGlathery, Patricia Wiberg, and Arthur Schwarzcchild of UVA to test water samples and mathematical models of Hog Island Bay, Gargathy Bay, and Magothy Bay. This project will help researchers predict how climate and land-use changes might affect water clarity and the success of seagrass restoration in Virginia’s bays.

Database of Mercury in Seafood from Chesapeake Bay

When scientists talk about mercury in fish, they often refer to one of three broad categories of fish: bottom feeder, middle predator, or top predator. But, says Michael Newman of VIMS, these categories don't provide consumers with useful information about the risk or benefit of local seafood they might eat. Using samples caught during a 2009 trawl survey, Newman and Mary Fabrizio of VIMS will analyze finfish for mercury and develop a database of mercury levels in fish based on fish species and size. By connecting mercury data with fish characteristics that are easy to observe, researchers may be able to help consumers more easily understand the risk or benefit of eating a particular fish.



Effect of Algal Blooms on Oysters

Harmful algal blooms occur regularly in the Chesapeake Bay, and these blooms could have negative effects on oysters grown for human consumption and for restoration. Kimberly Reece, Wolfgang Vogelbein, Thomas Harris, and Ryan Carnegie of VIMS will study the effects of algal bloom toxins on larval and adult oysters. By understanding the toxicity of these chemicals, oyster growers and restorers can decide whether to relocate or temporarily remove their oysters from the water during blooms with particularly harmful organisms.

Developing Protocols for a New Aquaculture Species

Americans eat more fish than they catch. Some of the difference is made up by seafood imports. Nevertheless, researchers are looking for species of fish that can be grown in the U.S. for human consumption. Michael Schwarz of Virginia Tech, Dan Sennett of VIMS, and Jesse Trushenski of Southern Illinois University at Carbondale will research the energy and protein needs of the Atlantic spadefish and develop



Heidi Geisz secured one of only ten Knauss opportunities working with the legislative branch. She'll work with the House Committee on Natural Resources under the ranking minority leader, Congressman Edward Markey of Massachusetts. As a doctoral student at VIMS, Geisz studied how pollution in glacial ice affects Antarctic seabirds.

"I am excited about this placement," says Geisz. "[Congressman Markey] is highly supportive of environmental issues, particularly combatting climate change, and is adamant that science back up policy decisions."

After her Knauss Fellowship, Geisz hopes to continue using her scientific knowledge in a career in science policy.

Kimberly Holzer will work as a Fish and Wildlife Biologist with the U.S. Fish and Wildlife Service during her Knauss experience. Holzer has a doctoral degree in environmental sciences from University of Virginia, a masters degree in teaching, and extensive teaching experience. As Fish and Wildlife Biologist, Holzer will work educate groups about different invasives and organize partners in invasive species control in the U.S. and abroad.



Holzer says she's excited to work at the intersection of policy and science. "[I'm a] marine ecologist by training. I'm excited to learn more about freshwater ecosystems and species linkages across the landscape," says Holzer.

Holzer plans to pursue a career in scientific research after her Knauss Fellowship.



Staci Hudy Rijal will join the Office of International Affairs of the National Oceanic and Atmospheric Administration in the Department of Commerce. Rijal attended Virginia Tech for both her undergraduate and masters work in wildlife science.

With the Office of International Affairs, Rijal expects to work on international fishing issues such as illegal, unregulated, or unreported fishing and sustainable fishing practices. "I'm very excited about the opportunity to learn more about how marine resource policy and diplomacy work at the international level," Rijal says.

Rijal hopes to pursue a career in science policy after her Knauss Fellowship.

Regional Grant to Support Studies of Sea-level Rise

Virginia Sea Grant is administering a request for proposals for regional research on the socioeconomic impact of, or behavior change in adaptation to, sea-level rise and inundation in the mid-Atlantic (New York, New Jersey, Delaware, Maryland, and Virginia). Up to \$135,000 is available for a single two-year project to be carried out by researchers at multiple institutions in multiple states. For details, go to www.vims.edu/seagrant/research.htm.

Workshop Discusses Catch Shares

In Seattle last November, Virginia Sea Grant Extension Leader Tom Murray and New Hampshire Sea Grant Assistant Director Ken La Valley organized a workshop to educate fisheries extension professionals and exchange information and experiences about catch shares. Catch shares are a way of managing fisheries in which fishermen, cooperatives, communities, or other entities are allocated a share of the total allowable catch. As long as fishermen do not exceed their share, catch share proponents argue that the system allows greater flexibility to fish when weather and market conditions are best. Complexities of deriving initial share amounts and helping fisheries and communities adapt to changes in management are both sources of concern with the use of catch shares. About 35 workshop attendees from around the country discussed the role of Sea Grant in facilitating discussion about and exploration of catch shares in U.S. fisheries.

Tasting the Difference in Local Oysters

About 130 people gathered at Kelsick Market in Gloucester Courthouse to put their tastebuds to the test, learning how to taste Virginia's local oysters. It was the first of what may become an annual event sponsored by the Tidewater Oyster Gardeners' Association (TOGA) and the Water Harvest Virginia Grown Program. Attendees tasted four oysters from each of six Virginia commercial growers and then tried to translate the flavors they experienced onto a tasting card that asked tasters to rank intensity of flavors such as salty, buttery, and metallic. At the end of the tasting, each person returned their tasting card to a bin at the entrance.

"The participants were pretty good at assigning salty ratings... they rated oysters coming from the highest salinity regions as having the most salty flavor and those coming from the lowest salinity regions as having the least salty flavor," says Mike Oesterling, Virginia Sea Grant Extension Agent and TOGA Board Member, who helped organize the event and review tasting cards. Aside from salty, he said, "Everyone had different opinions on flavors, and there really was no clear-cut favorite."

guidelines for spawning and raising spadefish in captivity. Schwarz notes that the Atlantic spadefish has many characteristics that make it a good candidate for aquaculture. This research will provide basic guidelines to help fish farmers get started growing spadefish.



Effects of Low Oxygen and Disease on Striped Bass

Striped bass prefer the cool waters deep in Chesapeake Bay, but in the last 50 years, oxygen has been depleted from these deep waters. Researchers have been asking how the combination of low oxygen levels and a common contagious disease might affect the survival of resident striped bass. Researchers Wolfgang Vogelbein and Mary Fabrizio of VIMS, Richard Brill of the National Oceanic and Atmospheric Administration, and David Gauthier of Old Dominion University will study the ability of striped bass to breathe under low-oxygen conditions in the laboratory. The team will compare these results with that ability in wild-caught fish, both with and without a particular disease, to determine whether infection makes fish more vulnerable to oxygen stress.

Multiple Tools for Predicting Seagrass Success

Seagrasses in the Chesapeake Bay have been declining since the wasting disease of the 1930s. To help seagrass restorers predict which places will be best for planting seagrasses, Richard Zimmerman and Victoria Hill of Old Dominion University and Charles Gallegos of the Smithsonian Environmental Research Center will combine two models that will predict restoration success based on water clarity and seagrass density better than either model could predict alone. Once the models are tested and combined, the end product could provide resource managers with a tool that links seagrass success to decisions on land that affect water quality.

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