

Buster's Seafor "A Commercial Fisherm.... Urbanna, VA

food at Farmers' Markets Watermen cut out the middleman

Virginia Sea Grant • Virginia Institute of Marine Science • The College of William and Mary

DR. JOHN T.WELLS Dean and Director Virginia Institute of Marine Science School of Marine Science The College of William and Mary

DR.TROY HARTLEY Director Virginia Sea Grant Program

TOM MURRAY Director Marine Extension Program

MARGARET PIZER Editor



The Virginia Marine Resource Bulletin is a publication of the Marine Extension Program of Virginia Sea Grant. The magazine is intended as an open forum for ideas, and the views expressed do not imply endorsement, nor do they necessarily reflect the official position of Sea Grant or the Virginia Institute of Marine Science.

Cover: Paige and Jimmy Hogge sell their catch at the Buster's Seafood stand at the Williamsburg Farmers' Market. Photo © Janet Krenn/VASG

FROM THE EDITOR

I'm excited to bring you this new issue of the *Virginia Marine Resource Bulletin*! Its production has been a bit delayed by my latest personal project my son Simon, who was born in October. Having a baby inspires a variety of new thoughts . . . of diapers, feedings, laundry, lost sleep . . . but also of the serious challenges that will confront those cliched "future generations" who suddenly have a name and a cute little face. That's why it's great to be back at work for an organization like Virginia Sea Grant (VASG) at such a critical time for our oceans and coasts, when the actions we take today can make a concrete difference for our future environment and communities.

One of the most exciting things about working for VASG is seeing new ideas bubble up from our scientists, researchers, and partners and watching those ideas transform and improve coastal industries and livelihoods. This issue of the *Bulletin* brings you stories of two innovative concepts that show real transformative promise: A Virginia Tech scientist is studying how a byproduct from the biodiesel industry could provide an inexpensive food for algae that make omega-3 fatty acids for nutritional use, and an Urbanna fishing family is blazing the trail for watermen to increase their earnings by marketing their catch directly to consumers.

This issue also includes some "news you can use," demystifying new legislation on No Discharge Zones in Virginia tidal creeks. The "News from the Point" section is chock full of information about upcoming grant and internship opportunities with VASG, new staff and advisors we've welcomed onto our team, and fun events we've hosted in recent months.

Notably, in January, VASG hosted our first annual Project Participants' Symposium, bringing together partners from academia, industry, and government to learn from each other and spark new innovative collaborations. I hope this issue's stories will give you new inspiration to learn more about VASG and to work in whatever way you can to ensure a sustainable future for Virginia's coastal environments and communities.

— Margaret Pizer

IN THIS ISSUE

Conference, Chefs' Seafood Symposium, and out first annual Project Participants' Symposium; and information about a new partnership between the Virginia Clean Marina Program and Elizabeth River Project.

Virginia Marine Resource Bulletin

Volume 42 Number 1 Winter 2010

Subscriptions to the Virginia Marine Resource Bulletin are available without charge upon written request or by sending an email to vsgpubs@vims.edu. Please specify whether you prefer a print or email-only subscription. Comments and questions may be directed to the editor at 804-684-7167.

COPYRIGHT ©2010 by Virginia Sea Grant

The *Bulletin* is printed on recycled paper using soy ink.

WILLIAM& MARY

This work is a result of research sponsored in part by NOAA Office of Sea Grant, U.S. Department of Commerce, under Grant No. NA96RG0025 to the Virginia Institute of Marine Science and Virginia Sea Grant. The U.S. government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear here.

FROM DISCOVERY TO MARKET

Algae turn a biodiesel byproduct into healthy fatty acids

by Phil Marsosudiro

Serendipity has a long history in science and technology. Alexander Fleming discovered penicillin by accident when he noticed a petri dish in which bacteria were not growing as expected. Sticky notes, microwave ovens, and even the chocolate chip were conceived while their inventors were trying to achieve something else. And in 2004, the career path of Virginia Tech professor Zhiyou Wen was radically altered by a chance conversation.

At the time, Dr. Wen was a postdoctoral researcher at Washington State University, studying ways to process animal waste. During a visit to the Washington State Department of Ecology with his advisor, an agricultural staffer happened to mention the Washington biodiesel industry and the glut of glycerol it produced as a byproduct. The staffer wondered out loud, "What are we going to do with all this glycerol?"

The question meant nothing to Wen until two days later when a lightbulb flashed in his mind. He remembered reading that glycerol (also called glycerine) is great feedstock for several species of algae. Wen suspected that some of those species might be great sources of DHA and EPA—two omega-3 fatty acids commonly found in fish oil that Americans have recently started to clamor for in their diets. Could he possibly meet consumer demand by growing algae from a biodiesel byproduct? Today, Wen is on the road to an answer, with funding from Virginia Sea Grant, the Virginia Agricultural Council, and several other agencies.

"We are only at the beginning of the race," says Wen, now an assistant professor of biological systems engineering at Virginia Tech in Blacksburg, "but the early results are promising. The DHA we are producing in the lab from crude glycerol has the same quality as commercially available DHA. Our first aquaculture tests verified that fish will feed on our product and accumulate the DHA, just like when they feed on algae in the wild."

ALL ABOUT OMEGA-3s

Americans are paying attention to omega-3 fatty acids, now that scientists and healthcare professionals have convinced them just how important omega-3's are for cardiovascular health and more. In their various forms, DHA, EPA, and ALA, play an essential role in reducing cholesterol, preventing problems with blood clotting, and assisting brain development in babies. Scientists are also examining their possible benefits for health issues as varied as depression, arthritis, and attention deficit disorder.

"The easiest way for people to get their DHA and EPA is through a couple of capsules in the morning and at night. Lots of people don't like to eat fish, but capsules are easy," says Damon Dickinson of Omega Protein, Inc., the nation's largest fish oil producer. "Many grocery products have omega-3s added during production," says Dickinson, who lists eggs, buttery spreads, salad dressings, and power bars as examples. "The food industry knows that consumers are looking for ways to get more omega-3s in their diets."

Omega-3 supplements are added to feedstocks for farmed fish and eggs and are also finding use in feedstocks for poultry and beef, to produce meats that have omega-3 content much higher than would occur naturally in grain-fed animals.

Dickinson quotes market studies showing that "growth in the last several years has been on the order of 35% a year, as people have been catching on," and that's driving the emergence of a multibillion dollar market.

Fish oil is the dominant source for DHA and EPA, today, and will likely remain so into the foreseeable future.

"Fish oil, like fish meal, is basically a global commodity, and the fisheries associated with this product, such as menhaden, are probably some of the best man-

aged fisheries in the world," says Schwarz at Virginia Tech. "Fish oil producers work very hard to make sure they don't overfish themselves out of business."

However, some stakeholders argue that the menhaden fisheries are a problem, either because of overfishing or because of the underestimated importance of menhaden to other marine life that feed on them.

While these questions have not been definitively answered, the market would likely embrace alternative sources of DHA and EPA if they can be produced at lower cost and environmental impact. If, in addition, the new sources came with some environmental benefit—such as Dr. Wen's use of an overabundant industrial by-product—they would be appreciated even more.

With luck, Wen will find a way to produce highquality DHA and EPA in bulk for aquaculture, animal feedstock, and even human consumption.

The Opportunity

Omega-3 fatty acids are compounds found naturally in fatty fish, such as salmon or tuna. Because most Americans don't consume enough fish to meet their needs, the pharmaceutical and food industries have responded by selling omega-3s in fish oil capsules and additives that they incorporate into everything from farmed fish to salad dressings.

In 2008, North Americans consumed more than 59 billion pounds of omega-3s, according to industry analysts, and as more benefits of these fatty acids to cardiovascular health emerge, use is expected to grow.

Dr. Wen's colleague, Dr. Michael Schwarz of the Virginia Seafood Agricultural Research and Extension Center (VSAREC), a Virginia Tech facility in Hampton, explains, "the increased de-

mand has put money in the market... Many groups are looking at different ways to produce omega-3s, such as from algae grown in ponds or indoor systems, yeasts, bacteria, or from genetically modified plant sources such as flaxseed etc."

The key to taking advantage of this opportunity, according to Schwarz, is to find a method that is inexpensive and yields a consistent and high-purity product. By pro-

ducing omega-3s from a cheap and abundant byproduct of the biodiesel industry, Wen hopes to do just that.

"Crude glycerol is easy to find," says Wen. Biodiesel production generates more than a hundred million gallons of waste product each year, and 70 percent is glycerol.

Starting Small

At this early stage, Wen is searching for the best combinations of algae and fermentation techniques to create the fatty acids. Until recently, it was be-



Products containing omega-3 fatty acids.

lieved that algae could only produce DHA, but Wen has found a way to produce EPA from algae.

"We worked on many species and failed many times," he says, "but eventually we found a species that can grow on crude glycerol and produce a high level of EPA. This result is very promising, and Virginia Tech owns the patent rights on this process."

Wen begins by preparing a batch of crude glycerol—several gallons that he'll need to grow multiple batches of algae. He dilutes the biodiesel waste product with water and neutralizes it with acid. After a few minutes, liquid settles out into layers." The bottom 70 percent or so is the crude glycerol we want," Wen says.

Next he combines the glycerol, algae, and nutrients in a fermenter, a glass chamber that is about twice the size of a gallon of milk and is equipped with a stirrer, thermometer, pH probes, and other instruments. Then he waits while the algae grow.

It takes three or four days to grow each batch, which Dr. Wen runs through a centrifuge to separate the algal biomass from the liquid. He then freeze-dries the biomass to obtain a dry powder full of DHA or EPA. This is the product that industry wants tons of.

"But right now, the process is very small," says Wen. "Running 24 hours a day, 7 days a week for three months, we end up with less than two pounds of DHA." Not quite tons.

The Path to Market

Dr. Wen has proven that his glycerol-fed algae can produce high-quality omega-3 fatty acids, free of heavy metals like mercury and lead, which are a concern with fish-derived omega-3s. But can Wen's process be done at industrial quantities?

"Scalability is one important factor in getting this process commercially viable, along with many other factors such as production speed, cost, quality, and consistency," says Dr. Schwarz. There are many questions, each of which requires rigorous testing and validation. Fortunately, Schwarz and his Virginia Tech colleagues can test some applications for Dr. Wen's omega-3s at their labs at the VSAREC in Hampton.

"For aquaculture, we can test Dr. Wen's product in fish feed to see how it affects growth, food conversion ratios, stress reduction, etc. We can also look at how well his DHA gets retained by the fish we feed it to and its subsequent effects on final product quality, safety, shelf-life, and consumer acceptance. All of these things are on the table, even while we collaborate with other Virginia researchers who might examine Dr. Wen's product for use in other land-based



Cobia are one aquacultured fish species that may be used to test a diet rich in omega-3 fatty acids from algae. Photo © Mike Oesterling/VASG

agriculture such as poultry or dairy production," Schwarz says.

Serendipity may have started this scientific project, but Wen and his team will need continued effort to convert the science into a commercial venture. Only then will their DHA and EPA make it into grocery stores and pharmacy shelves.

"Of course we'd be glad to find industry partners who can expand and use our process," Wen says. "Everything takes time, and there are many steps. But some people are already excited about the project. When I first described the project to a biodiesel producer, he was so excited. 'How many truckloads do you need?' he asked, 'It's all free.' I felt bad to tell him we only needed a few gallons."

But if all goes well at the Virginia Tech labs, Dr. Wen will need the truckloads soon. \checkmark



Marketer, Educator, Processor . .

Watermen take on new roles to bring seafood straight to consumers

t's 5 A.M. on a Saturday, and Paige Hogge is Lpulling away from her Urbanna, Virginia, home. Her car is packed with a tent, two tables, a cash register, and about 150 pounds of seafood. The load is topped off with almost 300 pounds of ice and boxes of zip-top bags, which she'll use to make "mini coolers to go" for her customers to keep their seafood from heating up.

Every Saturday from April through October, Hogge goes to the Williamsburg Farmers' Market to sell fish for her husband Jimmy's company, Buster's Seafood. She shares recipes, sells seafood, and makes ten times more per pound than other watermen make selling their catch exclusively to wholesalers.

Hogge is so encouraged by this success that in 2009 she started the Water Harvest Program, which will teach other watermen how they can make more money per pound by selling their catch directly to consumers.

When asked why she's willing to let others in on her secrets, Hogge explains that between her full-time job as an Administrative Assistant, regular Saturday and Sunday appearances at the Williamsburg and Dupont Circle Farmers' Markets, and Jimmy's six-day-a-week fishing business, "we really can't do any more. So why not share?"

Water Harvest

The Water Harvest Program began with a letter Hogge wrote to Governor Kaine and has since become a multi-agency-backed project, spearheaded by the Virginia Department of Agriculture and Consumer Services (VDACS) with financial support from the Virginia Fisheries Resource Grant Program and participation by the Virginia Sea Grant Marine Extension Program and the Virginia Marine Products Board.

In the summer of 2009, the program got its official start. Hogge sent out surveys to more than 600 watermen and aquaculturists to gauge their interest in learning how to sell direct at farmers' markets. Several watermen responded, and now Hogge is planning a Spring 2010 workshop to teach those interested everything they need to know to sell direct to consumers. The two-day workshop will consist of a tour of Buster's Seafood facilities and expert-led sessions on direct marketing and regulations.

"Early on we had wanted to do the program because it's clear that [direct sales] have been very lucrative for Paige and Jimmy," says Leanne DuBois, Manager of Direct Marketing Services for VDACS. "Paige is very passionate, and has seen other [watermen] struggle, not getting what they deserve for the time and effort they put in."

The Water Harvest Program seems to be arriving at the right time. Consumers are seeking out locally produced food, and according to Libbey Oliver, Director of the Williamsburg Farmers' Market, there's demand for seafood venders at Virginia's farmers' markets.

"Customers want to come to a market and get their eggs, pasta, flowers, anything they need to



Above: Paige Hogge sells Spanish mackerel to Karen Beale at the Williamsburg Farmers' Market. **Previous page:** Jimmy Hogge talks to a customer at the Buster's Seafood stall. **Facing page:** Jimmy Hogge handles softshell crabs at his shedding facility in Urbanna, VA. Photos © Janet Krenn/VASG

enjoy their week in between market days. Markets want to round out offerings with seafood," says Oliver. This year alone, eight markets in Virginia were actively looking for seafood producers to add to their offerings.

Buy Local

Customers at Hogge's booth at the Williamsburg Farmers' Market say that each bag of clams or fillets comes with an additional helping of satisfaction.

"When you buy at the farmers' market you're not paying for long-range transport and the pollution that goes with it," says Ron Merski, whose satisfaction comes from being eco-friendly.

Angelica Kitner says she buys most of her seafood from the farmers' market and indicates that knowing where it comes from gives her confidence in the product.

"I like it because I know it's fresh," Kitner explains.

These comments illustrate some of the appeal of the Buy Local movement, a national trend of seeking out, buying, and eating food produced near where you live. The trend has undoubtedly contributed to the success of Buster's Seafood at farmers' markets.

Demand for local foods is on an upswing in Virginia. Over the past seven years, the number of farmers' markets in the Commonwealth has more than doubled, from 60 to 150. And these markets are not only numerous, they're popular. In the summer of 2009, Virginians voted 6 of their farmers' markets into the top 20 in three categories of the America's Favorite Farmers' Market contest. Williamsburg Farmers' Market won first place nationwide in the mid-size division.

Expanding the Market

Not many people yelp for joy when they see Spanish mackerel, but that's just how Karen Beale reacted when she found one for sale at the Buster's Seafood tent at the Williamsburg Farmers' Market. Paige Hogge says more typical reactions range from children holding their noses and saying, "Ew! It stinks!" to older adults nostalgically remarking, "It smells like the ocean."

"We grew up fishing for Spanish mackerel both here and in South Carolina," explains Beale. "It's a fish you don't see on the menu in restaurants or in traditional markets. The only place you can get it is from small specialty places like this."

Because Virginians don't often see local seafood for sale, Hogge says she spends a lot of her time at the farmers' market introducing customers to seafood found only miles from their homes.

In fact, this seems to be the greatest challenge when it comes to seafood and the Buy Local movement: Exposing today's consumers to local product, when the mainstream American palate tends towards the three most popular seafoods shrimp, tuna, and salmon (little of which are harvested from Virginia waters).

Even without these popular products, Virginia produces a lot of seafood. The state has consistently ranked third or fourth nationwide in seafood landings over the past ten years, according to the National Oceanic and Atmospheric Administration's annual "Fisheries of the United States" reports. If all of the 460 million pounds of seafood landed in Virginia annually stayed in state, each Virginian would eat 16 meals of seafood per year. In reality, much of Virginia's seafood is exported to other countries or states where there is demand for the kinds of fish we have locally.

Tim Parsons, who at the time represented J.H. West Seafood, experiences first hand how regional tastes can affect a seafood business. As he rattles off six New England states and cities that make up the bulk of sales, he concludes that a very small portion of the company's 30 million clams stay in Virginia each year.

Parsons has been marketing clams for about 20 years. He estimates that J.H. West Seafood is one of the three largest clam outfits in Virginia, but notes that the demand for clams is not growing. To expand business, Parsons has to start at the beginning: creating demand.

"Basically, it's like planting a bunch of seeds," Parsons says of his efforts. "You don't know which ones will grow."

Educating the Consumer

One way Parsons has planted seeds is by participating in a program at Ukrop's supermarkets last August to educate shoppers about local seafood. Ukrop's teamed up with Mike Hutt and the Virginia Marine Products Board to feature Virginia watermen and Virginia seafood products at instore displays.

To improve customers' awareness of their Virginia seafood products, Ukrop's first invited Hutt and the Virginia Marine Products Board into its stores in 2008. The displays consisted of a table with free samples and brochures and offered customers the opportunity to talk with representatives from the Board and with Virginia watermen or seafood company staff members. Although the effort had a short-term impact—sales of Virginia seafood



jumped by eight percent during the promotion those increases didn't translate into long-term sales.

Hugh Davidson, Ukrop's meat and seafood buyer, suspects that there's some stigma attached to seafood, which accounts for about ten percent of total meat sales.

"It's almost as if people are scared of it," he says. "They may not have eaten it before, or they don't know how to prepare it." Davidson's sentiment is echoed at the farmers' market.

For More Information

Aquaculturists and Watermen who are interested in participating in The Water Harvest Program should contact Paige Hogge at 804-370-4210. An open house at Buster's Seafood facilities and a workshop are planned for this spring. "The marine world can be quite foreign to most of us," says Libbey Oliver of the Williamsburg Farmers' Market. She says that although there is currently demand for seafood at the farmers' market, customers still need some informal education about local products.

"It's a real exchange with the customer," says Paige Hogge, who has weekly conversations at the Williamsburg Farm-

ers' Market on everything from the seasonality of fish and environmental concerns to what species of fish are local to Virginia and how to prepare them. "I can't tell you how many people I taught to make oyster stew."

Land of Opportunity

It seems everywhere she drives in her town of Urbanna, Hogge sees fertile ground for developing the local seafood industry. She sees a vacant shucking house the size of a shed and thinks, "You could process clams in there." There's a large abandoned facility near a marina, and she can see it coming alive again as a high-throughput crab processing facility.

Behind the Hogges' Urbanna home is their soft crab shedding facility, where they hold crabs until they are ripe and can be packaged for sale. The facility is a cool, dimly lit labyrinth of tanks full of crabs zipping about.

The Hogges also have a seafood processing facility down the road.

"That [facility] had not been used for picking crabs in ten years," says Hogge, "so we had some upgrading to do and new requirements to meet." Some renovations were relatively simple tasks, such as painting walls or screening in areas to make them fly-proof. Others included the addition of a partition to separate the ice machine from the cool room and a conveyor belt to remove shells from the shucking room.

Paige is keeping her eye on another facility that would further expand Buster's Seafood's capabilities—the original shucking house that they leased from a neighbor during that first year at Williamsburg Farmers' Market.

"People think they need to build from scratch, but these places are here. All somebody needs to do is get a little interest and do some updating, and they can do what we're doing," she says.

Although there is a demand for direct-toconsumer sales, Mike Hutt of the Virginia Marine Products Board sees the capital investment and regulations as the biggest obstacles preventing other watermen from following Hogge's lead and selling their seafood direct to consumers.

To provide oysters, steamed crab, lump crab, fillets, and the occasional whole eel at Williamsburg and Dupont Circle Farmers' Markets, Buster's Seafood needs to follow more than 20 sets of regulations that govern everything from how they harvest and process fish and shellfish to using certified scales at the point of sale. Three reports get filed annually, while there are anywhere from 13 to 25 site assessments of the processing facilities throughout the year.

"Knowing a lot of these watermen, it's hard to say how many are going to step up, and it's not only a question of interest. There's getting the facility capability," Hutt says. "Certainly it will be beneficial if they can do it."

Despite the additional work she and Jimmy have put in making Buster's Seafood a directto-consumer business, Hogge is confident that watermen in the Water Harvest Program can benefit just as Buster's Seafood has.

"Now is a tough time to launch a program of any kind because of the economy. On the other hand, that might help this program because now might be the time that the watermen need to get the most out of their product," Hogge says.

NO DISCHARGE ZONES



Three years ago, the Lynnhaven River in Virginia Beach became the Commonwealth's first tidal creek to be designated as a No Discharge Zone (NDZ)—meaning that all boats are prohibited from releasing treated or untreated sewage into the river. Now, a bill passed by the State Assembly and signed by Governor Kaine last March aims to open the way for other tidal creeks to follow suit.

"The tidal creeks of the Commonwealth are hereby established as no discharge zones," says part of the legislation. A literal reading of that sentence has led to some understandable alarm and confusion in the boating community, but the immediate impact of the law will be less dramatic.

"The legislation might make it easier to go through the process of designating an NDZ, but it doesn't take the place of that process," explains Karen Forget, Executive Director of Lynnhaven River Now, a nonprofit group that was instrumental in getting the Lynnhaven designated as an NDZ. "It took us about two and a half years to work through the process from the initial application to designation."

No Confusion Zone

One of Jeff Chanat's jobs is to clear up any confusion about NDZs in Virginia. He's the state Department of Environmental Quality's (DEQ) point person for the NDZ designation process. Despite the language quoted above, says Chanat, the legislation "doesn't do anything to create



Jean DePalteau and Jacob Smith use the pumpout equipment at Urbanna Marina in Urbanna,VA. Photo © Margaret Pizer/VASG

NDZs, because that is a federal designation. The law is a resolution that all the tidal creeks within Virginia should become NDZs as soon as practical, and it's a mandate to the Virginia DEQ, which is the state agency responsible for designation, that we pursue that goal."

Because NDZs are federally designated, the state has to apply to the EPA to get the designation for a particular area, which could be defined as a single creek, or a group of creeks within a region. To win EPA approval, an NDZ must con-

tain adequate alternatives to discharge, including pumpout facilities at local marinas or access to portable pumpout equipment. A second and equally important criterion is public support. "We really have to demonstrate to the EPA that we are not forcing this down anyone's throat that the local community, the boating community, and the community at large are behind the idea," says Chanat.

The primary idea motivating the designation of NDZs is to prevent the release of fecal bacteria into waterways. "Human fecal bacteria are a problem in tidal creeks for a couple of reasons," explains Chanat. "First, they are simply indicators of pollution by human sewage," which could also contain pathogens such as viruses, protozoa, or other more dangerous bacteria. "Also, any sewage dumped from vessels contains nutrients nitrogen and phosphorous—which contribute to the huge nutrient problem that we already have in tidal creeks."

Chanat says that one discharge of raw sewage can have a huge impact in a small tidal creek. "A boating party of four adults going out for one weekend in one of these smaller creeks, assuming the water was completely pristine before they got there, could bring [water quality] down below shellfish standards for bacteria if they discharge their sewage. It doesn't take a lot of untreated sewage to make a big difference."

The Clean Water Act of 1972 outlawed the dumping of raw sewage in U.S. navigable territorial waters and specified requirements for marine sanitation devices (MSDs), which are devices for storing or treating sewage on board vessels. MSDs that simply store untreated sewage and optionally discharge it are referred to as type three devices. Type one and type two MSDs provide varying levels of treatment to the bacteria prior to releasing it.

"It has been against the law to discharge a type three device anywhere in territorial waters for a long time," explains Chanat. "What the No Discharge Zone idea puts forth is that maybe we don't want to dump anything whatsoever. So what NDZs regulate is the small proportion of boaters who have type one or two devices, who could otherwise legally discharge but would not be able to under the NDZ law."

Lynnhaven River Success

NDZ designation can be initiated internally by DEQ or externally by any local municipality, county, or city, but either way the guidelines and process are basically the same. In the case of the Lynnhaven, the city of Virginia Beach initiated the process. "The city was the applicant and a really strong advocate of doing this," says Karen Forget of Lynnhaven River Now. "We held several community meetings, followed all the guidelines for public announcement, had a comment period for the federal, state, and local designations, and we had very little opposition."

Forget says the Lynnhaven cleanup has been a huge success—as a result not only of NDZ des-

ignation, but a variety of other efforts, including sewage system improvements on land and a vigorous campaign to get dog owners to "scoop the poop" deposited by their pets.

The state Department of Health shellfish sanitation division has 36 test spots in the Lynnhaven because it was historically a rich oyster ground. "Before 2006, virtually the entire river was closed to shellfish harvest" because of high bacteria levels, says Forget. After NDZ designation, the percentage of the river open to shellfish harvest increased dramatically, reaching 31 percent in 2008. "That's a really big accomplishment," says Forget, "because the fecal coliform standard for shellfish harvest is very rigorous."

Full Speed Ahead?

Despite this success, both Chanat and Forget emphasize that boaters are not the only contributors to pollution in tidal creeks.

"I wouldn't want anybody to think that boats were the whole problem because they aren't, and boaters are pretty sensitive about that," says Forget. "The majority of boaters are going to do the right thing but there's a small percentage who are not going to and having the threat of being levied a big fine is really important to get complete compliance. Complete compliance is what you really have to have because just one illegal discharge pollutes a huge area of a river."

But NDZ designation irks some boaters who consider themselves environmentally conscious, says Keith Jones, an avid boater and owner of Compass Marina in Mobjack, Virginia. "There's no good data about how much boaters are contributing to the problem. If they are [discharging raw sewage] they're doing it illegally, and no one is really discussing the efficacy of the on-board treatment systems." Jones and others argue that these systems effectively remove bacteria and pathogens from treated waste, and that restricting the discharge of treated sewage does little to improve water quality. "All you're affecting [with NDZs] is a small percentage of the boaters who actually installed MSDs because they cared about the environment in the first place."

Proponents argue that posting NDZ signage makes all boaters more aware of discharge restrictions and that if designation helps prevent even one illegal discharge of raw sewage, the benefits will outweigh the inconvenience to boaters with type one or two devices. On that logic, several Virginia communities are moving ahead with NDZ designation. "The biggest initiative that we have right now is on the Northern Neck," says DEQ's Chanat. "This was initiated internally from DEQ with broad indications of support from county governments and other local stakeholders." DEQ is contracting with the Northern Neck Planning District Commission to do the legwork necessary to prepare those applications, which consists of



A kayaker enjoys the Lynnhaven River. Photo © Margaret Pizer/VASG

estimating the local and transient boat traffic, determining marina locations and the operational status of pumpouts, and conducting public outreach and education.

In addition, an application to designate Jackson Creek, Broad Creek, and Fishing Bay—all in the Deltaville area—as NDZs was approved by EPA in late August 2009; the federal designation was adopted as Virginia law in late October of that year.

"We're working with the Virginia Aquarium on another application right now for Rudy Inlet and Owl creek [in Virginia Beach]," says Forget, who sees these local, watershed-based efforts as the key to cleaning up the Bay. "Even people who would never in a thousand years identify themselves as environmentalists will get behind an effort that is in their community, where they understand exactly what's being done and they see the results." V

For more information contact Jeff Chanat at 804-698-4131 or Jeffrey.Chanat@deq.virginia.gov.

NEWS FROM THE POINT

New VASG Funding Opportunities

Virginia Sea Grant (VASG) is expanding the way we fund research. Based on feedback we received during the strategic planning process, this year we're trying some different approaches. Here are the opportunities that are currently available:

Coastal and Marine Sciences Pre-proposals Due March 15

These awards support research on Virginia's marine and coastal environments and are available to researchers at Virginia's institutions of higher education. This year, awards will be made at three levels. There will be one or two large research awards to support large-scale projects that tackle significant needs; four to eight seed research awards for preliminary and background research on promising concepts; and four to six awards to support graduate students on existing research projects.

VASG will fund projects related to:

- Science for ecosystem-based approaches to fisheries, aquaculture, coastal, and ocean management
- Human dimensions of coastal and ocean management
- Research and development for sustainable fisheries and seafood safety

Collaborative Fisheries Research Graduate Fellowship Due March 31

The fishing industry has amassed a wealth of knowledge, and the Collaborative Fisheries Research Graduate Fellowship will unite the experience of industry with graduate students interested in conservation engineering or fishing gear research. Through collaboration between industry and research, this fellowship aims to find solutions to lower bycatch and minimize habitat effects from fishing gear and practices. The fellowship will include a distance-learning course for the students, who will also contribute to an expanding community of fishery gear researchers and conservation engineers. Four or more fellowships will be awarded, providing tuition as well as research support.



Population Dynamics Fellows Mark Henderson and Patrick Lynch.

VIMS students win fellowships to study fish populations

How many fish are in the sea? For obvious reasons, it's difficult to estimate fish populations. But Patrick Lynch and Mark Henderson are trying to figure it out.

This fall, Virginia Sea Grant awarded Population Dynamics Fellowships to Lynch and Henderson, both graduate students at Virginia Institute of Marine Science (VIMS). The fellowship, co-funded by National Marine Fisheries Service and Sea Grant, provides financial assistance and career-building opportunities for Ph.D. students studying better ways to estimate fish populations by improving our understanding of the effects of fishing mortality, growth, recruitment, and natural mortality. This understanding is a key to maintaining productive fisheries, and this year's Population Dynamics Fellows believe their research will help to close gaps of uncertainty and enable better management of Virginia's fisheries.

Populations of Large Atlantic Fishes

Current models estimate fish populations based on reported catch. However, for bycatch species such as blue and white marlins, whose catches have been poorly reported, these data may not reliably predict population trends. By basing models on environmental and habitat data, Patrick Lynch believes some of these uncertainties might be overcome. To do this, Lynch will analyze data obtained from satellite tags and fishermen about the areas and habitats where blue and white marlins occur.

"The most exciting thing for me is the ability to use catch information to determine the status of a population and to see the results used in managing stocks," Lynch says.

Lynch is conducting his research under Dr. Robert Latour (VIMS Dept. of Fisheries Science) and Dr. Kyle Shertzer (National

Marine Fisheries Service). Lynch joined the VIMS Dept. of Fisheries in 2005 as a masters student, focusing on the feeding ecology of Atlantic menhaden. He holds a bachelors in bioengineering from Syracuse University (New York).

Distinguishing Populations of Summer Flounder

The U.S. Atlantic coast summer flounder population doesn't seem to be rebuilding very quickly, given measures taken to protect the fish in the 1990s and 2000s. Mark Henderson suspects that this could be because there is more than one stock of summer flounder in the Chesapeake Bay.

Uncertainty about the number of stocks could hinder rebuilding efforts, because different stocks, even of the same species, can have different rates of maturity and mortality. Henderson believes his study may uncover two distinct stocks of flounder that migrate along different routes and spend different amounts of the life cycle in the Chesapeake Bay.

Henderson will use three different types of tags to track flounder mortality and movement in the Bay.

"Mortality rates are notoriously difficult to estimate," says Henderson, but his study could help to resolve some of this uncertainty.

Henderson is conducting his research under Dr. Mary Fabrizio (VIMS Dept. of Fisheries Science) and Dr. Steven Cadrin (National Oceanic and Atmospheric Administration). Henderson holds a masters in aquatic and fishery science from the University of Washington and a bachelors in biology from the State University of New York at Geneseo.

Knauss Fellow translates science to policy



Meredith Ferdie Muth believes that "the cornerstone of good policy is reliable science," and as Virginia Sea Grant's 2010 Knauss Fellow, she will pursue her interests in uniting science and policy.

Muth's study of marine science has taken her across the globe. From Central America to Africa, she has taught

and studied in a variety of marine settings, including seagrass, mangroves, coral reefs, intertidal flats, temperate lagoons, and salt marshes.

However, Muth's interest in marine policy started long before her research. During her undergraduate years, she found herself sharing a house with two commercial lobstermen in Key West, Florida, during the time the Florida Keys National Marine Sanctuary was established. The local fishermens' response to this process

Coastal and Community Adaptation Proposals Due April 15

When it comes to changes in sea level,Virginia's coasts get a double whammy:The coast is sinking at the same time sea level is rising.VASG's Coastal Community Adaptation awards will fund technical assistance for coastal communities to plan for and adapt to these changing water levels and other climate change impacts. Projects will fund student-faculty teams to work directly with community planners and marine businesses in coastal communities to address effects of climate change.We look forward to funding one or two projects.

For information and application instructions, visit www.vims.edu/seagrant/research.

Internships offer a new lens on VASG

Last summer, Jackie Enterline became Virginia Sea Grant's first Science Communications In-



tern. During her eight week internship, she trailblazed a form of media with which we had little experience—online video.

Enterline worked to edit and produce a short movie about oyster gardening and

shed some light on how one becomes a Master Oyster Gardener, a designation awarded by VIMS, VASG, and the Tidewater Oyster Gardeners Association.

"Internships help you figure out what you want to do when you graduate, and this internship has me strongly considering a minor in multimedia because I realize how vital it is to have thorough computer skills," said Enterline, who transferred to George Mason University in January.

Enterline's video "Master Oyster Gardeners" can be viewed on our website www.vims. edu/seagrant.

VASG is currently seeking applicants for our 2010 Communications Internship, and we also offer internships for law and policy students.

For information on internships, visit www.vims. edu/seagrant/internships.

New Staff

Janet Krenn joined the VASG staff as a Communicator. Janet moved to Virginia from Boulder, Colorado, where she was responsible for communications for an environmental lab.



She has a bachelors in natural resources and environmental sciences and a masters in journalism from the University of Illinois.



Susan Park is VASG's new Assistant Director for Research. Susan earned a bachelors and masters in biology from the University of Pennsylvania before moving to the University

of Delaware for a Ph.D. in Oceanography. She joins VASG after several years as a Program Officer for the Ocean Studies Board of the National Academies in Washington, DC. Susan's primary role with VASG will be to manage the research and fellowship funding programs.

2009 Aquaculture Conference

The biennial Virginia Aquaculture Conference brings together fresh and saltwater aquaculturists to get updates on opportunities and issues facing the industry. This year more than 160 individuals halted their recovery efforts from that week's Nor'easter to attend the conference on November 13 and 14.

This year's presentations covered marketing (including an extensive session on Paige Hogge's Water Harvest Program, see pg. 6), best management practices, ocean acidification, land use planning, and an overview of Virginia shellfish aquaculture.

Keynote speaker Michael Rubino, director of the National Oceanic and Atmospheric Association's Aquaculture Program discussed NOAA's upcoming national aquaculture policy, which will be made available for public comment this spring. His presentation can be viewed at www.vims.edu/seagrant. moved Muth, who witnessed how policy can impact the livelihood of individuals.

"From that point on, I was always interested in conservation and management of natural systems, especially regarding how it affects the humans that rely directly on those resources," Muth said.

As a Knauss Fellow, Muth will work in the National Oceanic and Atmospheric Association's Climate Program Office. There she will work with the Office's Deputy Director, Ms. Ko Barrett, on international climate activities, including the Intergovernmental Panel on Climate Change (IPCC) and the Global Framework for Climate Services (GFCS).

Muth holds a Ph.D. in environmental sciences from the University of Virginia, where she studied marine plant ecology in East Africa. She also holds a masters in biological sciences from Florida International University and a bachelors in cellular and molecular biology from the University of West Florida.

The Dean John A. Knauss Marine Policy Fellowship is a prestigious program that provides a unique, year-long education experience to graduate students who have an interest in ocean, coastal, and Great Lakes resources and the national policy decisions affecting those resources. More information on the Fellowships can be found at www.seagrant.noaa.gov/knauss

VASG Hosts First Annual Symposium

"Thank you for introducing me to these challenges at this point in my career," said Russell Burke to the attendees of Virginia Sea Grant's Project Participants' Symposium. Burke, a post-doctoral researcher at VIMS, said the Symposium had been very helpful in framing current and emerging issues along Virginia's coasts and demonstrating how scientists, industry, NGOs, and resource managers could work together to address those concerns.

The Symposium, held on Wednesday, January 27, 2010 in Richmond, brought together nearly 100 individuals who have partnered with VASG previously. The daytime event consisted of 30-mintue presentations by VASG staff and partners, an extended networking and poster session, and a Futures Panel, which explored rapidly emerging issues. Through the Symposium, VASG launched our 2010-2014 strategic plan (available at www.vims.edu/seagrant); introduced participants to our research, extension, education, and communication capacities in hopes of planting seeds for future integrative projects; and provided a venue for stakeholder engagement and on-going strategic planning. The Symposium was followed by a seafood reception co-sponsored by the Virginia Seafood Council. The reception brought together nearly 200 officials, including high-ranking legislative, executive, industry, and NGO leaders in the Commonwealth.



Mermaid at Waterside Marina in Norfolk.

Clean Marinas join River Stars

In November, the Waterside Marina and Nauticus Marina in Norfolk were awarded Clean Marina status—becoming the first to receive that honor since the Clean Marina Program and the Elizabeth River Project's River Stars Program joined in a partnership to reduce pollution and improve habitat of coastal areas.

"Our boaters want to do the right thing and to dispose of their waste responsibly," said Tom Van Benschoten, general manager of the marinas, "and we want to make it easy for them to do the right thing" by making a pump out station accessible and helping boaters find safe ways to dispose of used motor oil.

In addition to becoming certified as Clean Marinas, Waterside and Nauticus are also pursuing River Star designation. To obtain River Star designation, the Marinas have taken steps to create habitat, including planting oysters.

Anne Smith, clean marina specialist with VIMS, says the partnership will expand the program's ability to reach marinas and encourage owners and operators to think about habitat.

The Clean Marina Program is a state-wide program administered by VIMS in partnership with VASG. Clean Marina certification is presented to marinas that have taken measures to limit and control water pollution on site.

Currently, there are 65 Clean Marinas (including Waterside and Nauticus) in Virginia and 74 River Stars.

For more information: The Virginia Clean Marina program is online at www.vims.edu/adv/cleanmarina, and the River Stars Program is at www.elizabethriver.org

VASG welcomes new advisory committee members

Virginia Sea Grant's advisors provide input to management on research and education strategies in response to our strategic plan, insights and recommendations on emerging coastal and marine issues, and guidance on organizational priorities and operations.

Dr. Kristina Hill

Dr. Kristina Hill is a landscape architect who considers how communities near water systems adapt to climate change. Her recent work looks at connections between community design and flood-related damage and pollution. Her book *Water, Ecology and the Design of Cities* is due out this year. Dr. Hill is associate professor and director of the landscape architecture program at the University of Virginia. To learn more about Dr. Hill's research and interests, view her presentation "Adapting Cities to Floods," available on the VASG website: www. vims.edu/seagrant.

Dr. Saied Mostaghimi

Dr. Saied Mostaghimi is a land and water resource engineer who studies how activities upstream affect water quality. His recent work considers at the impacts of agriculture practices, especially runoff of nutrients and bacteria. Dr. Mostaghimi is H.E. & Elizabeth Alphin professor and director of the Virginia Agricultural Experiment Station and associate dean for research and graduate studies at Virginia Tech.

Chefs learn about sustainable seafood

More than on hundred members of the Virginia culinary community attended the I8th Chefs' Seafood Symposium. The Symposium, co-sponsored by Virginia Sea Grant and the Virginia



Culinary Institute (a chapter of the American Culinary Federation), is held annually at VIMS to introduce chefs and culinary students to the science behind local seafood. Innet KrennWASG

Virginia Sea Grant Communications Virginia Institute of Marine Science PO Box 1346 Gloucester Point,VA 23062

Address Service Requested



Don't let anything keep you from getting the Virginia Marine Resource Bulletin.

Save trees by signing up for our electronic-only version. Just send a message to *vsgpubs@vims.edu*, and we'll send you an email when each issue is ready to download.

