CHESAPEAKE QUARTERLY

MARYLAND SEA GRANT COLLEGE • VOLUME 12, NUMBER 2

A Diverse Bay Watershed

contents

Volume 12, Number 2

CHESAPEAKE QUARTERLY July 2013

Chesapeake Quarterly explores scientific, environmental, and cultural issues relevant to the Chesapeake Bay and its watershed.

This magazine is produced and funded by the Maryland Sea Grant College Program, which receives support from the National Oceanic and Atmospheric Administration and the state of Maryland. Editors, Michael W. Fincham and Jeffrey Brainard; Science Writer, Daniel Strain; Production Editor and Art Director, Sandy Rodgers. Send items for the magazine to:

Maryland Sea Grant College
4321 Hartwick Road, Suite 300
University System of Maryland
College Park, Maryland 20740
301.405.7500, fax 301.314.5780
e-mail: mdsg@mdsg.umd.edu
www.mdsg.umd.edu
www.chesapeakequarterly.net

Cover photo: *Spotted salamanders (*Ambystoma maculatum*), including this one lying on a log near Ithaca, New York, are common across the eastern United States, including in the Chesapeake Bay watershed.* **Pages 2 and 3:** *Northern slimy salamanders (*Plethodon glutinosus*) collected from the mountains of Virginia bob inside one of the thousands of jars in the Smithsonian Institution's amphibian and reptile collection. Robert Reynolds (opposite page), seen here admiring a coiled snake preserved in a mixture of formalin and alcohol, says that his team has yet to collect all of North and Latin America's amphibians and reptiles.* PHOTOGRAPHS: COVER, JOHN CANCALOSI; PP. 2 AND 3, DANIEL STRAIN

The Colorful (and Disappearing) World of Bay Biodiversity

Daniel Strain

Robert Reynolds could get lost among all these jars.

Right now, the soft-spoken scientist is touring the Smithsonian Institution's amphibian and reptile collection, housed in a massive annex in Suitland, Maryland, called the Museum Support Center. The whole place seems like it's overflowing with glass containers — and there are, in fact, hundreds of thousands of them here. The jars are spread across three huge rooms and are neatly stored on dozens of metal shelves.

And in each one, there's a deceased animal. Or sometimes many, all floating in clear- to honey-colored preserving fluid. A good-sized fraction are from North America, including some that roamed the Chesapeake Bay region when they were alive. We walk past salamanders from the Blue Ridge Mountains, tadpoles from eastern Virginia, venomous snakes, and juvenile turtles the size of a half-dollar. But what Reynolds, a scientist who's based at the Smithsonian's National Museum of Natural History, seems to prize most about this collection is its diversity and organization.

To illustrate, he stops in an aisle and picks up a jar at random. Four cream-colored salamanders with black spots are suspended inside. They belong to the species *Notophthalmus viridescens*, or the Eastern newt, and were caught in western Virginia. Inside are numbers 556,994 to 556,997, Reynolds says, reading the jar's printed label.

Sure enough, each salamander inside has a small tag tied around its tiny ankle that bears its six-digit ID number, beginning with 556,994. As that number suggests, there are well over half a million reptiles and amphibians in this collection. The oldest ones from the 1800s were collected before formalin, a common preservative, was in wide use, so they were stored in whatever was on hand, often grain alcohol or rum. Reynolds himself has dabbled in that. Lacking better options, he once brought home a bat he had caught in Mexico in a bottle of cheap tequila.

So with a collection this eclectic and this huge, you can see why Reynolds is obsessed with order.

"If you misplace a jar in this collection, it is lost," says Reynolds, who directs the U.S. Geological Survey's Biological Survey Unit, a group that collects and curates North and Latin American vertebrates, or animals with backbones, for the museum.

It's a good reminder of the sheer scope of the Smithsonian's biological col-

lections and of North America's biodiversity. There are so many animals and plants out there for Reynolds and others like him to discover.

But in the wilds of Maryland and elsewhere, many of the animals preserved here are also vanishing at an alarming rate — like the Maryland darter (*Etheostoma sellare*), a small and yellowish fish that hasn't been seen since 1988.

The Biodiverse Bay

Biodiversity is a fluid term with any number of definitions. It can refer to the total number of species living in an ecosystem. But it can also describe the diversity of functions that different organisms perform within an ecosystem. Or even the diversity within a single species.

In a simple sense, the term describes variety in the forms and shapes of life. Wade into a stream, dig up a clump of dirt in your garden, or turn over a log in a forest and you'll see it: lots of wriggling, crawling, swimming, or leafy life.

Putting a number on that variety has never been easy. Even in regions as well studied as the Chesapeake Bay watershed, there are still a lot of animals and plants on land and in the water that are small, rare, and hard to count.

Maryland's Natural Heritage Program, which monitors rare and endangered species regionally, keeps those tallies. The program recognizes 1,232 vertebrates as native to the state, including 635 fish and 21 salamanders. The Chesapeake Bay Program, a coalition of state and federal agencies, estimates that more than 2,700 species of animals and plants live throughout the Bay.

Those numbers, while high, can't compare to the biodiversity that you'd find in a tropical region. And, in fact, when the topic of biodiversity comes up, talk almost always turns to rainforests or coral reefs. But the Chesapeake Bay's biodiversity is no less important to its health and proper functioning. Even scarce species like the Shenandoah salamander (*Plethodon shenandoah*), which is known to live on only three mountains in Virginia, contribute.

"The plants and animals that are here, they evolved together," Reynolds says. "They have this incredibly tight, synergistic network that functions amazingly well."

In other words, the region's plants and animals fill unique roles in their environments. Although many people argue for preserving this web of life for moral or aesthetic reasons, there's also a practical benefit that can be expressed in dollars and cents. In the Chesapeake region, marsh plants trap pollutants coming from streams and rivers, small fish like menhaden provide food for bigger fish like striped bass, and trees absorb carbon dioxide from the air — all actions that the Bay's human residents depend on.

Increasingly, economists have worked to estimate monetary values on these "ecosystem services," which globally may run into the trillions of dollars (see Small Wonders, p. 5).

Studies indicate that greater diversity of species makes natural communities more stable and productive. This generates more ecosystem services and helps the ecosystem to survive environmental changes more easily.

"If the entire world becomes corn and cockroaches and starlings and six or eight species that live pretty well with humans, it's not only going to be spiritually depauperate," says Emmett Duffy, a scientist who studies marine biodiversity at the Virginia Institute of Marine Science in Gloucester. "But we're also going to be in big trouble."

Biodiversity Loss

In Maryland and other states around the Bay, salamanders like the ones in Reynolds's jars are in trouble. They live in the streams and pools that trickle down to the Chesapeake Bay. Many are sensitive to even tiny changes in temperature or pollution levels in those waters, making them important bellwethers for the state of local waterways.

And many, like the Eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*), aren't doing too well. This giant of a salamander, which looks like a river boulder, has grown rarer and rarer in the mountains of western Maryland, likely because of the loss of good streams there.

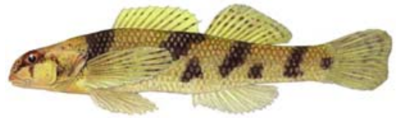
Globally, signals of trouble are visible in the large number of species at risk of extinction and the unusually high rate at which species are vanishing.

Scientists estimate that the extinction rate today is 100 to 1,000 times higher than the "background" or average extinction rate during the history of life on earth. If that's the case, half of all living species could slip away by 2100.

Shrinking habitats, increasing pollution levels, invasive species, climate change, and an array of other challenges have slowly pared away the world's plants and animals. Worldwide, around 25 percent of mammal species, 30 percent of freshwater crabs, and 40 percent of amphibians are threatened, according to the International Union for the Conservation of Nature (IUCN), a conservation group.

Scientists will tell you that it's hard to accurately measure the scale of biodiversity loss, both around the world or in an area like the Chesapeake watershed. In our region, though, there are certainly marquee examples. In part because of the zeal of watermen that sought their roe, only a few hundred spawning Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) live in the Chesapeake region today, most of them in the James River.

Maryland Species at Risk

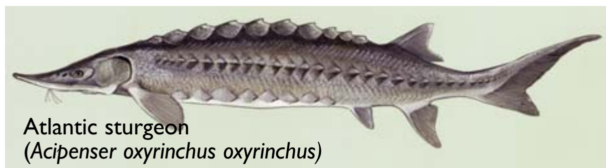


Maryland darter
(*Etheostoma sellare*)

Discovered in 1912, this small fish was known as the only vertebrate that lived in Maryland and nowhere else.

Eastern hellbender
(Cryptobranchus alleganiensis alleganiensis)

These salamanders, which can grow to more than two feet long, live exclusively underwater.



Atlantic sturgeon
(Acipenser oxyrinchus oxyrinchus)

Atlantic sturgeon grow to about six feet long and have a row of bony plates running down their sides. Their ancestors date back to the time of the dinosaurs.

Bog turtle
(Glyptemys muhlenbergii)

Dwarf wedgemussel
(Alasmidonta heterodon)

Bog turtles (above left), found in swamps and marshes, are the smallest turtles in North America, measuring only about 4 inches long. The microscopic larvae of dwarf wedgemussels (above right) spread far and wide by hooking themselves onto the bodies of swimming fish.

IMAGE CREDITS: MARYLAND DARTER, DAVID NEELY; EASTERN HELLBENDER, BRIAN GRATWICKE, WIKIMEDIA COMMONS; ATLANTIC STURGEON, DUANE RAVER; BOG TURTLE, U.S. FISH AND WILDLIFE SERVICE; AND DWARF WEDGEMUSSEL, SUSI VON OETTINGEN, U.S. FISH AND WILDLIFE SERVICE

An estimated 128 species have already been lost from Maryland. Deep in the Smithsonian's archives, for instance, sit a handful of specimens of the Maryland darter. Scientists were lucky to catch the fish in 1965 — even then, it could only be found in a few small creeks that flowed into the Susquehanna River near Aberdeen, Maryland. Today, the specimens are some of the last reminders of the darter's existence. For reasons that remain unclear, the fish hasn't been seen since 1988.

In all, Maryland's Natural Heritage Program lists 345 plants and 139 animals as endangered, threatened, or in need of conservation in Maryland — meaning they run the risk of following the darter's fate. But being listed doesn't guarantee that a species will recover.

Such figures touch on only part of the picture, says Maile Neel, who studies rare and endangered plants at the University of Maryland, College Park. Many species are in decline, even if their populations are still too large to land them on an endangered species list. "You may have the species still here, but 90 percent of their populations are gone," says Neel, an associate professor of plant science and landscape architecture. "That's a decrease in biodiversity, but those [cases] are really hard to quantify."

For other species, scientists haven't even realized that losses are occurring, Neel says. There simply haven't been enough scientists to detect declines in many obscure species, such as insects or crustaceans living in bay-grass beds. Around the Chesapeake, species may be going extinct before scientists have had the chance to discover or name them.

The end result is that although scientists are sure that biodiversity loss has happened and is still happening here, no one knows exactly how large that loss is. But the consequences for the entire ecosystem seem sizeable in certain cases, especially that of an iconic Bay species, the Eastern oyster (*Crassostrea virginica*). Although these bivalves aren't listed as an endangered species in Maryland or Virginia, their numbers in the Chesapeake Bay are at less than one percent of historic levels. And because these organisms filter sediments and nutrients from the Bay, their loss may have had a large impact on water quality and the ecosystem.

Scientists agree that the global loss of biodiversity is a big deal. In a paper published in *Nature* in 2012, researchers suggested that it could have as much of an impact on the proper functioning of ecosystems as many other environmental conditions that are damaging them. Those include climate change and nutrient pollution, both sizable concerns on the Chesapeake.

Reynolds, surveying his jars, notes another loss: the scientists who study biodiversity, he says, have experienced their own population declines. Because of budget cuts, many museums have trimmed back on their staff considerably. Reynolds has watched as his colleagues retired one by one without younger scientists coming to replace them. Museum collecting and curating also isn't as popular a field as it once was — maybe because it's viewed as stodgier than other disciplines at the forefront of scientific innovation.

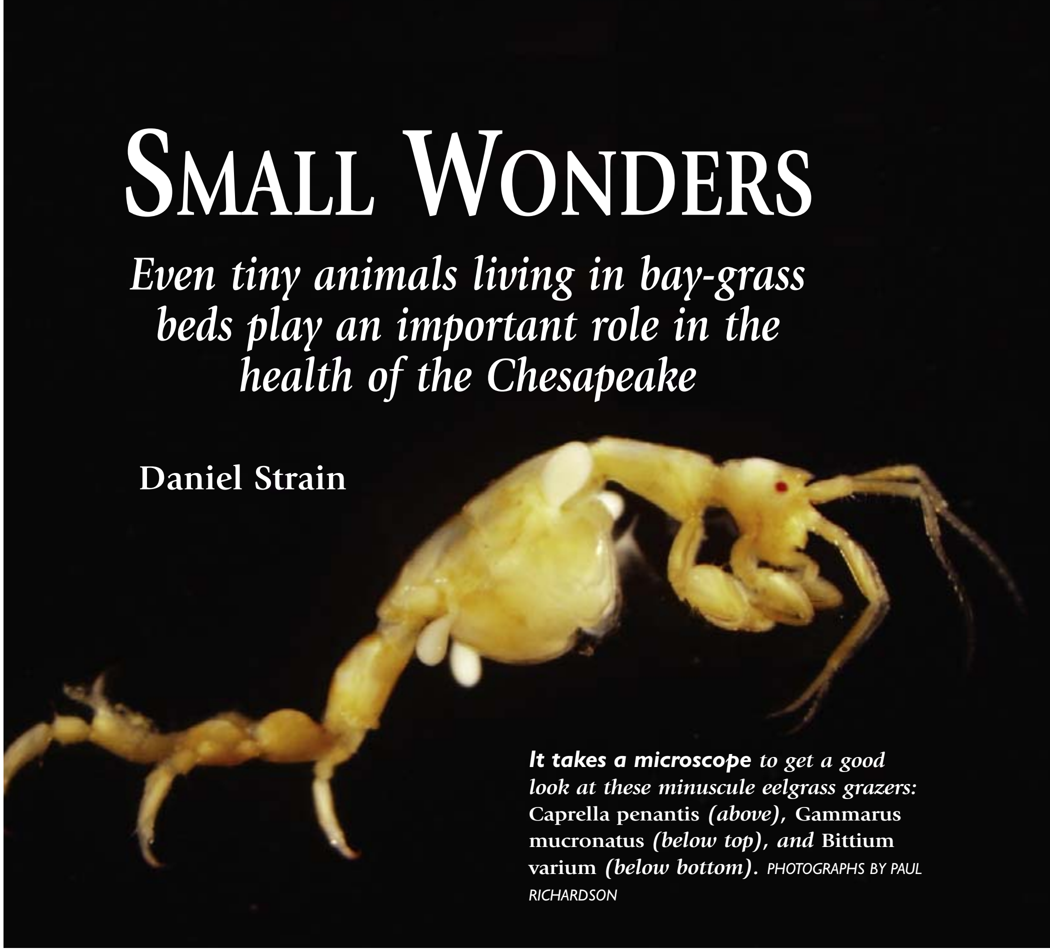
"The irony is, at the time when biodiversity is more in the news today than ever previously, there are fewer and fewer people and fewer dollars to support it," Reynolds says.

But Reynolds and his colleagues have continued to build their collections, even as many other museums have shut theirs down. And his jars are a profound reminder that there's still a lot of biodiversity left to protect. Scientists say that preserving species will depend on solving difficult and potentially costly challenges in the management of natural resources in Maryland and worldwide. Those challenges include mitigating and adapting to climate change, stopping the spread of invasive species, preserving natural habitats, and reducing the flow of excess nutrients into waterways.

Reynolds says he certainly holds out hope for the future. "Am I hopeful? Absolutely," he says. "I'm a realist. But I'm hopeful."

That's something worth preserving — no museum collection jar required.

— *strain@mdsg.umd.edu*



Small Wonders

Even tiny animals living in bay-grass beds play an important role in the health of the Chesapeake

Daniel Strain

***It takes a microscope** to get a good look at these minuscule eelgrass grazers:* **Caprella penantis** *(above),* **Gammarus mucronatus** *(below top), and* **Bittium varium** *(below bottom).* PHOTOGRAPHS BY PAUL RICHARDSON

Emmett Duffy is going hunting for " 'pods."

He lowers himself from his boat into the water off the Goodwin Islands near the mouth of Virginia's York River. The scientist sinks waist-deep in his wetsuit, but he's pleasantly surprised. It's been a cool spring, and he was expecting the water to be chillier. "Not too bad," he says to the handful of researchers out with him today. "Alright, let's have some fun."

The water's crisp and clear today, so you can make out the clumps of eelgrass (*Zostera marina*) poking up from the sandy bottom, around three feet below the surface. It's the start of what by summer will be a thick and green Chesapeake Bay grass bed. And this is where Duffy, a marine scientist at the Virginia Institute of Marine Science (VIMS), will be looking for a kind of biodiversity that few people have the patience or wherewithal to see.

To get a better look, Duffy's lab manager, Paul Richardson, scrapes a net along the Bay bottom, then dumps the contents into a tray. There are scores of small creatures amid the blades of eelgrass and ribbon-like algae.

Richardson fondly refers to them as bugs or 'pods because most of the creatures are types of crustaceans called amphipods. The most numerous are the caprellids. If you peered at them through a microscope, these skinny, green animals (*Caprella penantis*) would look like tiny plant stems. Right now, they're clinging to the eelgrass blades, curling and unfurling like inchworms. Then there are small snails, called gastropods (*Bittium varium*), sporting shells that look like peppercorns. Richardson counts more crustaceans that resemble petite shrimp (*Gammarus mucronatus*).

In all, it's a world that takes attention and good eyesight to appreciate. "Who cares about bugs?" Richardson jokes. "We do."

They have good reason to care about them. Duffy and his colleagues have discovered that the creatures they collect in their trays do a lot to keep these underwater grass beds clean. The small animals consume harmful algae that otherwise would grow on the plants and stunt their growth.

Often seen in a mask and snorkel, *Emmett Duffy may talk about the economic benefits of maintaining biodiversity, but he also thinks ecosystems like eelgrass beds have a value all their own. Recently, to sing the praises of small eelgrass grazers, Duffy strummed guitar in a music video produced by his lab. Called "Grazer," it was set to the tune of "Loser" by Beck, a staple of the 1990s alternative rock scene.* PHOTOGRAPH BY JAMES KEALEY

Research like Duffy's shows that preserving biodiversity in the Bay and elsewhere is important, not just for its own sake. It's also important to people. Even small, hard-to-find organisms like these 'pods are part of the web of life that stretches up from eelgrass beds to crabs and striped bass and, eventually, to people.

Despite its importance, biodiversity in the Bay and other marine habitats is fragile and threatened. Duffy says there's a lot to learn about it before more is lost.

"Biodiversity is not just an aesthetic issue," Duffy says. "It's fundamental to how nature's life support system works for us."

For the Love of 'Pods

On this spring morning, Duffy looks at home in his mask and snorkel. They've been his window into learning about the beauty of biodiversity. As a graduate student in the 1990s, he spent five weeks diving on Australia's Great Barrier Reef. "It was this absolutely other worldly experience," he says. "Huge fish, tons of coral, clear water."

But since then, that coral reef has lost large portions of its big fish and coral. So have other marine communities worldwide, for many of the same reasons — overfishing, global warming, increasingly acidic waters, invasive species, and nutrient pollution among them, researchers have concluded. As biodiversity has suffered, Duffy says his outlook has expanded to consider how its loss could affect humans and their wallets. "I now understand that that's a really important other aspect," he says. "Since the world is run by economics, you have to talk about that."

Scientists now agree that diverse ecosystems also tend to be healthy ecosystems — and potentially lucrative ones. They use the term "ecosystem services" to describe the economic benefits created by the web of life. Those benefits include things like an active seafood industry, added value to real estate, and clean drinking water. In Maryland alone, seafood generates an estimated $600 million in economic gains each year. Tourists, many of them drawn to the Bay, spent more than $14 billion in the state in 2011. The full worth of the Bay's ecosystem services is probably much larger.

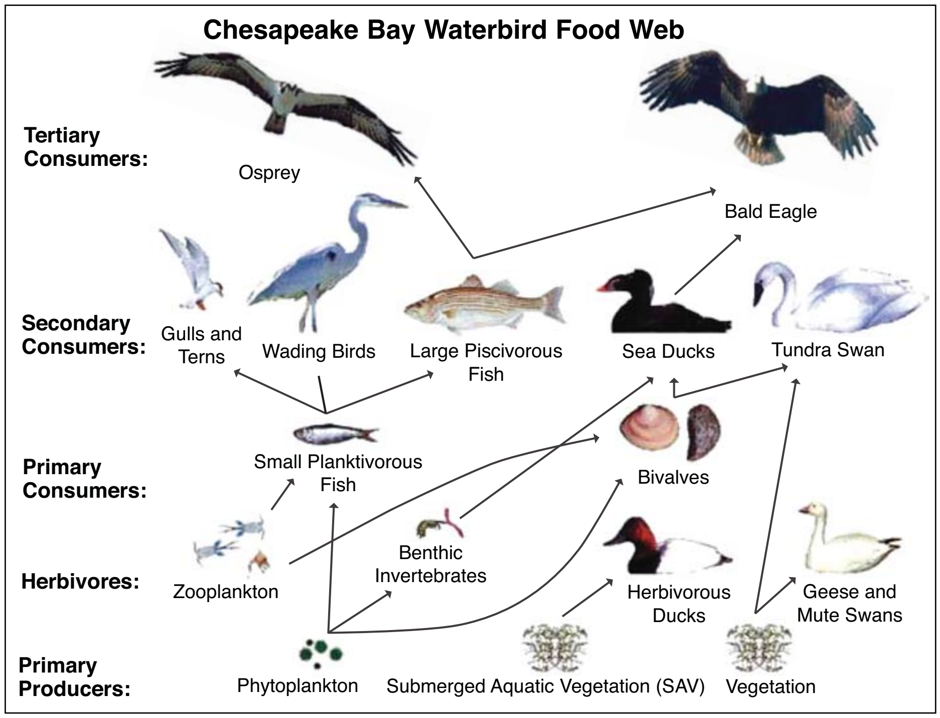
In the Chesapeake Bay, that value rests partly on some of its tiniest residents, like the algae grazers. The 'pods aren't as captivating as tigers, pandas, and other zoo animals, but they deserve some respect.

To understand, consider the eelgrasses dotting this chain of islands on the York River. Besides providing a home for fish and crabs, these plants deliver other important benefits in the Chesapeake. They trap sediments that would otherwise cloud the water, and they soak up excess nutrients that feed dangerous blooms of algae.

But come back during the summer, Duffy says, and you'll see a layer of brown fuzz that looks like gnarly dryer lint covering much of this eelgrass. It is actually a type of algae that grows directly on plants. Such "epiphytes" are common around the Bay but can be bad news — when nutrients in the water are plentiful, this algae grows a little too abundantly. A thick layer of epiphytes can block sunlight from reaching the underwater plants, essentially causing them to starve. What's more, unlike trees, eelgrasses in the Bay grow in monocultures. So if they die off, there are no other species to come in and take their place.

That same fuzz contributed to the collapse of underwater vegetation across the estuary in the 1960s and 1970s, brought on by increasing nutrient and sediment pollution and other factors. Historically, such plants may have covered more than 600,000 acres of the Bay's bottom. In 2012, that number was less than 50,000 acres. It's hard to put a dollar amount on such a loss, but the decline of bay grasses around the estuary has likely taken a huge toll on the local fishing, seafood, and tourism industries.

Thankfully, bay grasses have a natural ally in the 'pods. They graze on the smothering algae like tiny, helpful cows. Duffy and his colleagues conducted an experiment on the Goodwin Islands that demonstrated the importance of this behavior. The researchers used a special, repelling chemical solution to chase graz-



Lush eelgrass beds surround the Goodwin Islands *(map above left) near the mouth of the York River. Such Bay grass communities support the Chesapeake food web (graphic above), providing food and shelter for many Bay animals, including fish, birds, and crustaceans. But excess nutrients and sediment in the Bay fuel the growth of special kinds of algae known as "epiphytes" (the brown fuzz covering the eelgrass in the photo above) that can overrun grass beds, thinning them out.* GOODWIN ISLAND DETAIL MAP, GOOGLE MAPS, ADAPTED BY SANDY RODGERS; INSET BAY MAP, ISTOCKPHOTO.COM/UNIVERSITY OF TEXAS MAP LIBRARY; PHOTOGRAPH, JONATHAN LEFCHECK; GRAPHIC, U.S. GEOLOGICAL SURVEY (MODIFIED FROM PERRY ET AL., 2005)

ers away from certain eelgrass beds. When the grazers were gone, algae growth more than quadrupled on the plants. In other words, these cows make a big dent in algae populations. The team published their results in 2013 in the journal *Ecology*.

The diversity of grazing species is important, too, Duffy says. In a 2010 paper published in *Marine Ecology Progress Series*, his team showed that communities of grazers made up of many different species ate a lot more algae than less diverse herds. There are a number of reasons why that could be. It's possible that "if you have more than one species, they may be using resources more efficiently," Duffy says. On its own, each animal might focus its gluttony on only one type of epiphytic algae. Put a lot of species together, however, and they can consume the whole smorgasbord of algae.

That benefit of diversity seems to be a general phenomenon. In a project called the Zen Experimental Network, or ZEN, Duffy teamed up with scientists at more than 15 sites worldwide who also investigated grazers on eelgrass. This notoriously widespread plant grows from Alaska to Portugal and Japan.

The number of species at each of these sites varies. In the Bay, a typical bed will host 15 to 20 species of grazers, including the caprellids, gastropods, and others in Richardson's tray. But you can find dozens of species in San Diego or only a handful in Norway. Still, preliminary results from the project indicate that no matter the site, "when you have more diverse grazers, you see less algae," Duffy says.

Think of the grazers this way: they clean up after humanity's mistakes by providing an important counterbalance to nutrient pollution. But as important as the creatures are, scientists don't have the data to say whether small grazers across marine habitats worldwide are thriving or struggling.

Bay Health Plan

Similarly, there's a lot that scientists don't know about the status of marine biodiversity in the Chesapeake Bay. You could point to certain species that exist only as small reminders of their former abundance: oysters, shad, and Atlantic sturgeon, to name a few. But researchers don't monitor many organisms further down the food chain, or at what scientists call a lower "trophic level," to estimate whether the numbers of these small organisms are climbing or falling. So while Duffy's grazers may be threatened in the Bay — just like shad or oysters — no one knows for sure.

That sort of information could tell you a lot about the health of the whole estuary. It's not just because grazers help bay-grass beds, but also because such small animals are important food for fish. In other words, protecting biodiversity doesn't just mean protecting a lot of different species at one step in the food chain, but throughout the entire ecosystem.

"I think that we need to do this [monitoring] if you want to ensure sustainability and productivity" of the ecosystem, says Edward Houde, a fisheries scientist at the Chesapeake Biological Laboratory at the University of Maryland Center for Environmental Science. "You do want to protect the lower trophic levels in the ecosystem."

What's clear is that biodiversity in the Chesapeake is likely more fragile and easily disrupted than in more diverse ecosystems. As in most estuaries, the salt levels here are rarely steady, thanks to the never-ending tides that send jolts of salt water into and out of the Bay. That makes it a tough environment for many of the plants and animals who live there.

As a result, the Bay hosts more than 2,700 species of plants and animals — a big-sounding but modest number compared to what you'd see in many tropical ecosystems. The Great Barrier Reef, which Duffy visited years ago, is home to an estimated 5,000 or more species of mollusks alone, including clams, octopuses, and oysters.

The bottomline is that the Bay can't stand to lose much of its biodiversity; it has relatively little to begin with. Take small crustaceans: A single shrimplike crustacean — a species of opossum shrimp that grows about as long as your fingernail called *Neomysis americana* — is a primary source of food for many of the region's juvenile fish. Those include young weakfish, summer flounder, and striped bass. Lose that shrimp, and a lot of animals that people like to eat could go hungry.

"You have less redundancy," says Andre Buchheister, a graduate student at VIMS who studies fish biodiversity in the Bay. "So if something happens to one species or one group, you have the potential for altering the system much more dramatically."

Responding to this lack of knowledge about marine biodiversity, Duffy led a team that proposed the creation of a Marine Biodiversity Observation Network. In a 2013 paper in the journal *BioScience*, he and his colleagues advocated a wide monitoring program that could be undertaken globally or in a local habitat. It would track the rise and fall of marine life at all levels of the food web. Right down to little grazers.

On the Chesapeake, many scientists have already begun work that could fit into such a network, Duffy says. Scientists at VIMS, for instance, conduct a regular trawl survey of the estuary, pulling up fish that live near the bottom of the Bay to monitor how their populations are doing. By combining this survey with others, including his own work on the Goodwin Islands, Duffy says that it may be possible to get a much better look at the Bay's biodiversity from top to bottom.

"We basically need a health plan for biodiversity," he says. "We need to have a monitoring program so we can keep our finger on the pulse and find out what's wrong so we know what to do."

He'll be among those giving the 'pods their checkup.

— *strain@mdsg.umd.edu*

Does Forest Biodiversity Matter?

John Parker is in a hurry. This ecologist at the Smithsonian Environmental Research Center (SERC) and his colleagues have only a week or two to finish planting 24,000 trees along a farm close to Maryland's Rhode River.

The trees — which are about a year old and not much more than a twig and a root — are about to bud. If they're not planted when that happens, the trees will lose water through their roots and could die.

But the stress and the hard work is worth it. When Parker is done planting, his farm — which extends over six fields and 30 acres near Edgewater, Maryland — will have become one of the largest biodiversity experiments of its kind. He's not just interested in planting a new forest. He wants to figure out how you build a better forest. In other words, do forests grow best when they contain only one species of tree? Or many?

"It's a way of asking, 'Does biodiversity do anything?'" Parker says. And could local biodiversity contribute to the health and stability of the Chesapeake Bay watershed?

Among those questions, Parker is planning to test how planting a new forest here will affect the quality of the water streaming below this farm. Trees can absorb excess nutrients — such as the nitrogen and phosphorus that generate yearly "dead zones" of low- to no-oxygen water in the Bay — through their roots. Forests can become potent tools for cleaning up the Chesapeake.

But they're not as common as they once were in Maryland. In fact, nearly 90 percent of the state may have once been covered with trees, compared to a mere 40 percent today.

In that sense, Parker's study, which he hopes will continue long after he retires, is exploring not just what biodiversity does, but what happens when it's lost. He and his successors will gather data here that could help them understand how losing forests and forest biodiversity across Maryland has impacts that trickle down to the Chesapeake itself.

That's a relatively new focus in biodiversity research, says Emmett Duffy, a marine biologist at the Virginia Institute of Marine Science (VIMS). Before, he notes, scientists were more interested in how the planet's biodiversity arose rather than what it did. But over the last 15 years, they've begun to address what happens when biodiversity disappears.

For details about Parker's research, read "Biodiversity Buds in Maryland" in this issue of *Chesapeake Quarterly* online by scanning the code below or by going to:
www.chesapeakequarterly.net/v12n2/trees

— *Daniel Strain*

THE DIVERSITY WITHIN

The diversity within a species of bay grass could play a key role in its restoration and survival

Daniel Strain

***Wild celery shoots float** in the Potomac River. These were just a few of the plants that Maile Neel and her colleagues saw during their strenuous, four-day bike ride.*
PHOTOGRAPH BY MAILE NEEL

The scientists left Cumberland, Maryland on their bikes on a steamy summer morning. Their destination was Washington, D.C., nearly 185 miles away and down a looping trail, the C&O Canal, that follows the Potomac River. The ride wasn't a pleasure jaunt: along the way, the five researchers would stop about every six miles to wade into the river to collect aquatic grasses.

This survey-by-bike, which took four days to finish, was the brainchild of Maile Neel. She works as a plant scientist at the University of Maryland, College Park. The scientist, whose time outdoors shows on her tanned skin, competes in "ultra-distance" rides, crossing nearly 750 miles of terrain in only 90 hours. So the team's pace of about 45 miles a day was downright leisurely for her. It was less easy for the four students she brought along, some of whom hadn't ridden a bike in years.

The sore hamstrings, however, were worth it. On their trip, the five riders were able to collect shoots representing the full range of diversity in the upper Potomac's wild celery (*Vallisneria americana*).

This green plant, which has thin leaves that roll with the current, is one of the most common and recognizable species of underwater vegetation in the Chesapeake Bay watershed. And it plays an important role in the ecosystem, helping to trap the floating, excess nutrients and sediments that make the Bay's water murky. These aquatic grasses also provide shade and shelter to dozens of Bay animals.

But just like people, wild celery plants aren't all alike, Neel explains. Look closely, and you'll see subtle differences in the lengths of their roots and the widths of their leaves. Scientists have uncovered other, less-obvious differences, too, such as how well the plants tolerate saltiness in the water. This diversity of characteristics comes from the unique combination of genes — called a genotype — that each of these plants carries. The differences help the plants to survive in the unique habitats where they grow.

Such genetic variety within a single species is a form of biodiversity. But how important this genetic diversity can be to the survival of a species is still poorly understood. It was a question that Neel and her team wanted to answer for wild celery in the Bay. "Ultimately, the question is, does the genetic diversity that's present have some contribution…to how these populations are going to respond to climate change or to environmental assault," she says.

In many cases, the answer seems to be yes. New scientific tools have revealed that genetic diversity within a single species may be important for the long-term survival of a species. Understanding this diversity could change how scientists approach restoring vulnerable bay grasses to the Chesapeake watershed, where their numbers have dwindled because of deteriorating water quality and other factors.

"You can't just treat a species as a monolithic entity," says Randall Hughes, a marine ecologist at Northeastern University in Massachusetts. "There's a lot of diversity within that species that is important."

Such research suggests that biodiversity benefits ecosystems at many different levels — not only when multiple species are working together (see Forest Biodiversity, p. 8) but also when there is a lot of variety within a single species.

Mountains to the Bay

In a greenhouse in Frostburg, Maryland, plant scientist Katia Engelhardt can see that genetic diversity beginning to emerge. She points to a corner of the greenhouse in the sun where several rows of plastic buckets have been lined up on a table. They're filled with water and a few inches of sediment. And wild celery sprouts.

"There's some that are just popping up now," says Engelhardt of the Appalachian Laboratory, part of the University of Maryland Center for Environmental Science. Sure enough, if you lean over and peer into the buckets, you can see a few poofs of wild celery starting to poke out of the mud.

While its name may call up thoughts of supermarket veggies, wild celery is a bay grass known for its green leaves that can grow several feet long. In the summer, you can find wild celery swaying in freshwater portions of the Bay and its tributaries, mostly from the Potomac north to the Susquehanna River.

The plants spread throughout the Bay in two ways, Engelhardt explains: by scattering their seeds, like many flowering plants, and by reproducing asexually, like aspen trees. They do that by sending out underground shoots that sprout into genetically identical plants — called clones.

Engelhardt, who's grown a lot of aquatic plants during her career, likes to spend time out here in this greenhouse with the grasses. She calls them "graceful."

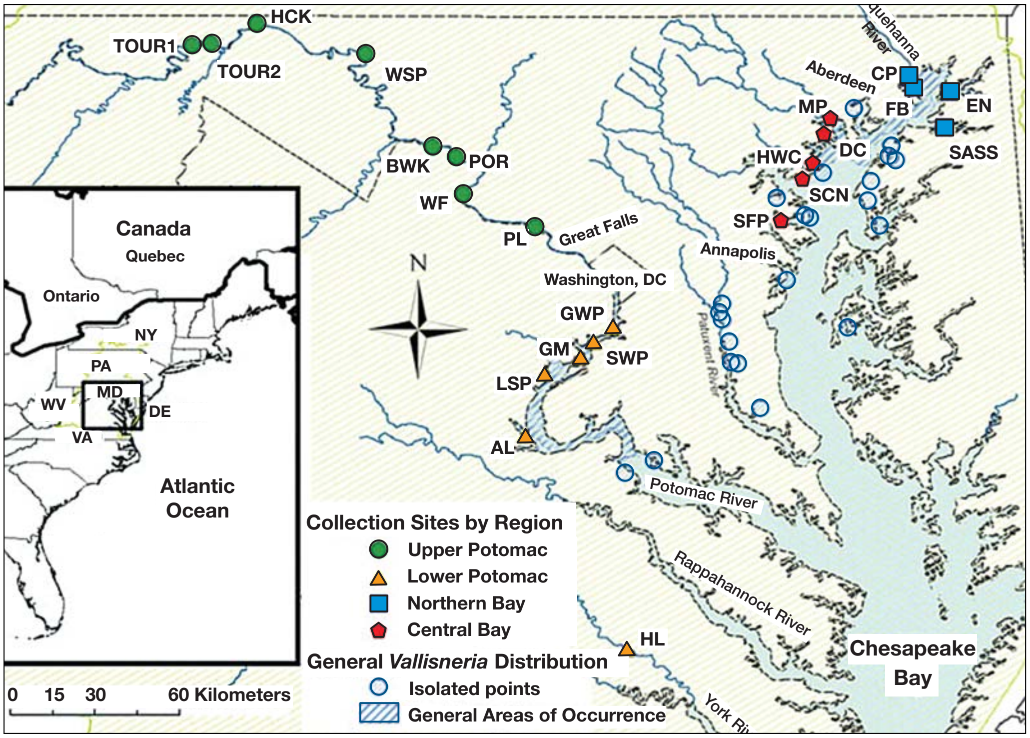
"They seem to have a personality," she says. By which she means that each one in each bucket is a little bit different.

These plants were all plucked from different locales, including the northern stretches of the Potomac where Neel began her trek.

Before beginning their trip, *Maile Neel and colleagues pose in front of a sign (top) for Cumberland, Maryland, 184.5 miles away from Washington, D.C., on the C&O Canal. From left: Brittany West Marsden, Hayley Tumas, Paul Widmeyer, and Maile Neel. Wild celery (middle) grows during its peak in mid-summer. More recently, Neel, West Marsden, and Tumas gather in the greenhouse (bottom) to plant wild celery "tubers," small structures that spend the winter buried under sediment.* PHOTOGRAPHS BY MAILE NEEL (TOP AND MIDDLE) AND DANIEL STRAIN (BOTTOM)

Engelhardt's favorites are a group she's studying from the Sassafras River, a small tributary that empties into the northernmost regions of the Bay far from the Potomac. These plants have unusually long and lush leaves. But their roots are surprisingly short and dinky — perhaps, she suspects, because the river has a sandy bottom in which plants can anchor without needing long roots.

Visible features like these that help organisms to survive are what biologists call adaptations. They're programmed by a plant or animal's DNA, or genetic code. Differences like these can be seen in the genetics of wild celery all across the Bay.



Through genetic analyses, Maile Neel and colleagues *discovered that the Bay's wild celery (*Vallisneria americana*) populations are split into four distinct zones: what they called the upper Potomac (green markers), the lower Potomac (orange), the central Bay (red), and the northern Bay (blue). Plants from one zone rarely mix with plants from another zone.* MAP SOURCE: LLOYD, BURNETT, ENGELHARDT, AND NEEL, 2011, CONSERVATION GENETICS 12:1269-1285, USED WITH THE PERMISSION OF THE AUTHORS

In 2007, several years before Neel began her cycling trip, colleagues Neel and Engelhardt took on a different survey to explore this variation. In research funded by Maryland Sea Grant, they pulled up shoots from rivers up and down the Bay. Then a team decoded, or "sequenced," the DNA of each plant. Such sequencing is cheaper than ever, giving researchers an unprecedented ability to explore the genetics of Bay species.

Engelhardt and Neel uncovered a surprising diversity: the team collected 675 wild celery shoots, discovering 427 separate genotypes. That suggests that the Bay is dominated by a lot of unique individuals rather than a few, widespread clones. Their work also indicated that the personalities that Engelhardt had spotted among the plants in her buckets had likely arisen from the grasses' diverse genetics.

The team hadn't expected to find that much diversity. That's because it's an axiom in biology that as the range of a species shrinks, so does its genetic diversity. And populations of bay grasses within the Chesapeake watershed have shrunk a lot.

For centuries, wild celery had helped to keep the Bay clear by trapping excess nutrients and sediments in the water column. But as long as a century ago, human activities began to overload the estuary with those same nutrients, such as nitrogen and phosphorus. Those fed huge blooms of algae that cut underwater plants off from sunlight, stunting or killing them. Add in copious sediments floating in the water, and by the 1960s and 1970s, the natural ability of aquatic plants to clear the water was overwhelmed.

The Bay's grasses received a further death blow when record quantities of sediments were washed into the estuary by Hurricane Agnes in 1972. Today, plants like wild celery and eelgrass (*Zostera marina*) cover around 10 percent or less of their historic area, according to ongoing monitoring work by scientists at the Virginia Institute of Marine Science.

How wild celery has remained so genetically diverse despite this great decline remains unclear — but the surviving diversity may offer hope for the future recovery of the species in the Bay. That's because a growing body of research indicates that populations of genetically diverse plants are better able to ride out environmental disasters.

Randall Hughes of Northeastern University was one of the first scientists to show how genetic diversity can help underwater plants to recover from environmental disturbances. As a graduate student in California, Hughes planted a few dozen square meters of eelgrass, creating plots carrying different levels of genetic diversity. In some plots, the grasses were very different on the genetic level. In others, they were more alike.

For a while, however, she didn't see any difference in how they grew. Then, months into her research, flocks of geese descended on Hughes's study site and devoured most of her plants. That's when she noticed something interesting: the eelgrass plots with higher levels of genetic diversity survived the attacks in better shape than did other plots. The scientist and her colleagues published their results in 2004 in the journal *Proceedings of the National Academies of Science*.

As Hughes puts it, "When there is disturbance or stress, that's when diversity tends to really shine."

To understand why, think of a Swiss army knife. These camping gadgets have tools for opening a can of beans or uncorking a bottle of Zinfandel.

Individual organisms in a population are also like tools, each one carrying its own genetic code that allows it to tackle certain problems. Like the Swiss army knife, however, more diverse populations have a broader toolkit to draw from than less diverse ones. As a result, they can respond to crises in many different ways. Some plants may be good at fending off geese, while others can grow well in especially muddy water. When the environment changes, "if one genotype doesn't do well, another genotype will do well," Engelhardt says.

Populations with low genetic diversity, however, don't have that flexibility. They're like the lone can opener or corkscrew, useful in some situations but not others.

Engelhardt hasn't completed similar research using wild celery, but she suspects that what's true for eelgrasses should be true for them. In other words, the high levels of genetic diversity in the Bay's wild celery should provide the population with the raw materials it will need to recover and survive many future disasters — including, perhaps, warming waters due to climate change.

That survival advantage could also translate into expansive and thick grass beds that can better do what they do well: namely, to make the Bay's waters clearer. To top it off, large grass beds can also slow down waves in the Bay, helping to save the local shorelines from rapid erosion.

Or as Neel notes, high levels of diversity in the Bay's wild celery means that "we're very lucky."

Bay All-Stars

Neel has spent much of her career studying endangered plants, such as silvery-white milkvetch (*Astragalus albens*) from California. So, tongue in cheek, she says it's nice to focus on a species "that's got some hope."

But luck and hope can only get you so far. Bay grasses around the estuary still face significant problems, including low light levels in many habitats. Overcoming that may require research studies with yet another focus: how can you use genetic diversity to your advantage?

Neel collected some data years ago that may help answer that question. During their sweaty, muddy bike ride along the Potomac, she and her colleagues noticed something curious about the river: compared to other patches of wild celery scattered around the Bay, the Potomac carried a lot of widespread clones. In fact, grasses belonging to just one genetically distinct line stretched down the waterway for nearly 100 miles. It was a feat that Neel and Engelhardt hadn't seen in any other Bay tributary.

Dipping her hands into a bucket *filled with water and a layer of sediment, Katia Engelhardt pulls out a thin wild celery shoot. "I like to get my fingernails dirty and wet," she says.* PHOTOGRAPH BY DANIEL STRAIN

What the scientists couldn't be sure of, however, was why this line of clones was so prolific. "Are they widespread because they're the best performers in all these environmental conditions, or are they there by chance?" Neel asks. In other words, were the plants lucky, or are a few genotypes in a diverse population simply better at growing than others?

To further test that, one of Neel's students, University of Maryland undergraduate Hayley Tumas, conducted a simple experiment in the greenhouse using light. She grew diverse kinds of wild celery, collected from all around the Bay, under different light levels. Some had access to a lot of sunlight while others were shaded. And, sure enough, certain individuals naturally grew better than their counterparts in the shade. They seemed to carry genes that gave them an advantage when light was low.

Such insights could benefit aquatic plant managers, says Lee Karrh, a biologist at the Maryland Department of Natural Resources. He's overseen many bay-grass restoration projects locally, including replanting two acres of wild celery in Baltimore County's Back River. But the success rates of such ventures are low. Few of the plants that his team sows ever grow into adult plants. One of the most persistent problems, he suspects, is the turbidity of the surrounding water — floating sediment has made much of the Bay too opaque to allow little plants to grow.

Experiments similar to Tumas's, however, might be able to identify a particular set of plants that could grow well even under those tough conditions. If Karrh planted just those plants, he suspects that his restoration projects would have a better shot at succeeding.

It's a way to take advantage of the diversity that the Bay's wild celery offers — like forming an all-star baseball team. If conditions are rough, you plant only those grasses that have the best odds of surviving the growing season. Neel and Engelhardt's research is "allowing us to fill in the pieces that we were missing," Karrh says. "What genotypes do we need to put where for what growing conditions?"

Still, a lot more research will have to be done before the scientists know which genotypes do best under which conditions. And managers like Karrh will have to balance efforts to build a wild celery team using a few star players with the need to keep genetic diversity high — equivalent to maintaining a deep bench. The environment could change, making today's all-stars tomorrow's wash-ups.

But regardless of the strategies that managers take, genetic diversity can only do so much, especially if the Bay's water quality stays poor. The best way to ensure the future of wild celery is to reduce the excess nutrients and sediment in the estuary that have slammed its populations so drastically, Neel says. She's standing in her own greenhouse and looking over a few sprouts of wild celery beginning to grow inside their buckets.

At least in this peaceful setting, one thing is true: "If you have clear water, these things are hardy," she says. "They'll grow."

— *strain@mdsg.umd.edu*

Discovering the Chesapeake: Profiles in Science

THE MAN WHO LOVED LACROSSE

Reginald Truitt & the Chesapeake Biological Lab

Michael W. Fincham

This is the second article in a series about the pioneers of Chesapeake Bay science.

In the summer of 1919, a brand new graduate student carried a borrowed microscope to a creek north of Solomons Island, Maryland, a knob of land near the meeting point of the Patuxent River and the Chesapeake Bay. In a cramped fisherman's shack, he set up a makeshift laboratory, installed his microscope, and began studying oyster biology.

Reginald Van Trump Truitt, already 27 years old, was a man in a hurry. He soon moved his microscope to the parish hall of a local church and in 1924 he began calling his one-room, largely self-financed operation the Chesapeake Biological Laboratory. By 1929 he helped persuade the Maryland governor and legislature to approve the first marine lab in Maryland that would conduct ongoing scientific research on oysters and blue crabs and finfish. It is now the oldest marine lab on the Bay and one of the leading centers in the country for fisheries research.

It began, however, as the unlikely offspring of a self-confident and single-minded man who was better known in his youth for his charm and his lacrosse than for his science. At the Maryland Agricultural College, Truitt was famous as "Rags," the man who brought rag-time dancing to the campus and led the lacrosse team as both captain and coach. After serving as a high school principal and a pilot with the Army Signal Corps, he returned to College Park as a graduate student in zoology where he was quickly recruited to coach the lacrosse team. The little ag college he'd attended was now reorganized as the University of Maryland, and the new school had big ambitions for its sports teams.

Truitt, however, had his own ambitions about sports and science, and his strong-willed pursuit of them would help shape the future of lacrosse in Maryland and the fate of his new lab on the Chesapeake. When he took the coaching job, Truitt refused any salary. It was the quixotic stance of a classic amateur, an idealist who would coach, he said, for the love of the game — even in an era when college sports were quickly professionalizing. Though his lacrosse position came with no pay, it carried plenty of pressure. The new school wanted to make a name for itself in a state that featured powerful teams from old-line schools like Johns Hopkins, Navy, and St. John's College.

When he decided to study oysters down on Solomons Island, Truitt made a similar move, this time defying the chairman of his zoology department. Shellfish and finfish in Chesapeake Bay were best studied by the federal government's Bureau of Fisheries, according to the chairman, and not by scientists with the state's land grant university. If a grad student wanted to waste his time studying the ecology of the Bay, he was not to use any of the department's microscopes. It was the start of a long disconnect between the University of Maryland and the lab at Solomons Island.

It was also the start of an unusual odyssey. Seldom derailed by rejection, Truitt borrowed a microscope from Washington College and headed for the island. His ambitions there were both academic and commercial. He was a grad student determined to do a thesis on oysters, but he was also the son of sea captain turned businessman who grew oysters in Chincoteague Bay over on the ocean side of the Eastern Shore. When the young Truitt arrived on Solomons Island, he said he wanted to figure out the best places to plant shells and seed oysters in Maryland's Chesapeake Bay.

It was, in some ways, another quixotic gesture. There was clearly little interest in oysters in academic circles at the University of Maryland. And there was active opposition in the seafood industry to oyster farming in a state where watermen were able to dredge and tong oysters off the great reefs that God and nature had built around the Bay.

In pursuit of his oyster interests, however, Truitt would usually prove adept at finding powerful allies. When he wanted to learn about marine biology, a topic not taught at his university, he talked scientists at the Bureau of Fisheries into training him at their Connecticut Laboratory. In Annapolis, the grad student soon won the support of Swepson Earle, the powerful head of the state Conservation Commission, the forerunner of the current Department of Natural Resources.

For most of the 1920s, Truitt was betting an unusual trifecta: he was an unpaid oyster scientist at Solomons Island, an unpaid oyster adviser in Annapolis, and an unpaid lacrosse coach at College Park. Only two of his bets would pay off. In 1929, the governor and legislature, pushed by Truitt and Earle, approved a state-funded marine lab, and soon after put Truitt on a payroll as director. The Chesapeake Biological Laboratory would soon have new brick buildings located on the island where his first lab had been a fish shack.

His lacrosse job, however, didn't pay off well. It eventually led Truitt into a troubled relationship with the man who might have proved a powerful ally in building his new lab. As a coach, Truitt reported to H.C. "Curley" Byrd, the athletic director and football coach who was so popular around the state that he would soon become president of the University of Maryland.

On paper at least, Truitt and Byrd looked like natural allies. Both were the sons of successful Eastern Shore oystermen: Truitt came from the Snow Hill area, Byrd from Crisfield. Both became athletes at the old Maryland Agricultural College: Truitt lettered all four years in track and lacrosse, Byrd was the school's most famous star in football, baseball, and track. Both came back to College Park to coach sports teams. Both were handsome, charismatic, and personable. Both were builders.

Reginald Van Trump Truitt *was a popular lacrosse coach and scientist who founded the Chesapeake Biological Laboratory. He battled with Curley Byrd over the fate of his laboratory.* PHOTOGRAPH, COURTESY OF TRUDY GUTHRIE

H.C. "Curley" Byrd *was a popular football coach who became president of the University of Maryland. He tried — unsuccessfully — to take control of Truitt's laboratory.* PHOTOGRAPH, UNIVERSITY OF MARYLAND ARCHIVES

For Byrd, a key step in building a new university was success in sports, especially in football and lacrosse. "Byrd believed very sincerely that the way for a university to become a great university was for it to become known, for it to become loved by the people," said historian George Callcott. "And the best way for it to become known and loved by the people was to have winning teams."

As an unpaid coach, Truitt did his part for the upstart university — he built winning teams — but he eventually became uncomfortable with Byrd's tactics. By 1924 the *Washington Post* was crediting Truitt with launching the university as a national lacrosse power. As a zoology instructor, however, Truitt resented Byrd's habit of sending football players into his classes for automatic passing grades. According to his daughter, Trudy Guthrie, Truitt came to consider Byrd "academically corrupt" in his quest for winning teams. It was an unlikely animosity that would bedevil Truitt's efforts to build his new marine lab.

The Chesapeake Biological Laboratory would open its first building in 1931 as a state agency, not as an arm of Curley Byrd's University of Maryland. And for three decades it would stay that way. The lab was headquarters for the Maryland Department of Research and Education, the state's first institution to focus ongoing research on the Chesapeake Bay. Perhaps its key mission in its early days was offering advanced summer training in science, and Truitt recruited students and faculty from Johns Hopkins University and St. Johns, Goucher, Washington and Western Maryland Colleges. He also won research funding from the prestigious Carnegie Institution of Washington, D.C.

In attracting supporters, Truitt was able to draw on his family wealth, his political connections, and his personal charm. "He was the Jay Gatsby of the scientific community," said John Wennersten, a historian and author of two books on the Bay. "He drove a nice car, he wore a nice suit, he was in demand at cocktail parties in Annapolis, he flourished in the highest circles. He'd put his arm around you and talk about bridge or snooker or pool or the latest yachting regatta.'"

At his new lab Truitt quickly did something fairly spectacular: he saved the oyster industry from a full-scale disaster. In his brand new building, he ran experiments with Japanese oysters, the fast-growing species that was already the mainstay of a profitable West Coast industry and was now drawing the interest of East Coast oyster growers. Truitt placed 10 Japanese oysters in lab tanks with Chesapeake oysters, induced spawning from both species, and examined the larvae that resulted.

When he looked through his microscope, he saw hybrid larvae, and the discovery drove him to end the experiment and drain his larvae onto the ground. If Japanese oysters grew in the Chesapeake, he said, they could crossbreed with native oysters, and their offspring could quickly spread throughout the Bay.

One result, he said, might be a Bay full of unattractive, untasty oysters. Another might be the introduction of parasites, a hotly debated topic that divided oyster scientists into opposing camps. And on this issue, Truitt proved far sighted. Nearly 30 years later, a disease epidemic called MSX would begin devastating oyster populations in Delaware Bay and Chesapeake Bay. Nearly 70 years after Truitt's experiment, scientists would finally identify the cause of the MSX epidemic: a parasite found on Japanese oysters.

In 1932, Truitt told the legislature that the Japanese oyster could be "a genuine yellow peril," and his nativist appeal inspired the legislature to move at warp

Truitt was still, in his core, the classic idealist who saw himself leading a crusade. He was, he said, "selling the movement" to pursue science in the service of conservation.

speed and ban the planting of Japanese oysters in Maryland waters. Though MSX epidemics would eventually spread through the state's oyster grounds, Truitt's research and lobbying helped buy valuable decades for the oyster fishery.

Truitt used those decades to develop techniques for farming oysters — only to see his work used to save the traditional public fishery for wild oysters. He set up a large experimental oyster farm on the Honga River on the Eastern Shore where he was able to plant 1,000 acres with shells and other substrates, then bring in seed oysters and close off the grounds to commercial harvest. His farm allowed him to test ideas about the best places for growing seed oysters, the best times for planting shell, and the minimum time for raising marketable oysters. His strategies turned an overfished area of Bay bottom into a productive oyster ground.

His findings would outlast his farm. Responding to the political clout of watermen, the state later reopened his Honga River farm to public harvesting and tongers quickly overfished it. Over time, however, the state of Maryland would adapt Truitt's strategies to restock and revive public oyster grounds, turning a wild fishery into something close to a sustainable "put-and-take fishery" that helped support watermen and seafood packers for nearly 50 years.

His research success, however, didn't win Truitt much support at the University of Maryland. He would remain on the zoology faculty until 1941, and for many of those years he would try to shift the lab to the university, a connection that would, he thought, turn the lab into a major research center. By 1935, however, the new president of the university was his old boss, Curley Byrd, who was now proving hugely effective at political deal making and fundraising in both Annapolis and Washington. As president, however, the ex-football coach steadily resisted pleas from the ex-lacrosse coach to link up the university and the marine lab. When Truitt scheduled visits to the president's office, Byrd kept canceling. And when he didn't cancel, he sometimes kept Truitt waiting for hours. According to Gene Cronin, the scientist who would succeed Truitt as lab director, Truitt came to see Byrd as an enemy and competitor.

That competition shaped the fate of Truitt's lab for two decades. When Byrd was finally ready in 1940 to absorb the Chesapeake Biological Laboratory into his growing university, Truitt was no longer interested. Citing a decade of indifference from the university, Truitt said he would stick with those who stuck with him during the early days: namely the state of Maryland's Department of Conservation and the other colleges around the state that sent him students and faculty and funds.

Truitt was still, in his core, the man who loved lacrosse, the classic idealist who saw himself leading a crusade. He was, he said, "selling the movement" to pursue science in the service of conservation, and he apparently wanted true believers by his side. He told Byrd that in building the lab, "I used my own personality, all that I stood for, and all that my vision indicated the future to hold for hydrobiology and conservation." He was not about to turn his lab over "bag and baggage, even to my own institution, the University of Maryland."

Truitt's lab would live apart from Byrd's university. In his campaign to popularize hydrobiology, his term for marine biology, Truitt gave speeches and wrote newspaper articles, eventually making himself "Mr. Chesapeake" for his era, the man the press, the public, and the politicians turned to for advice on Bay issues.

In 1954, Byrd tried to make himself "Mr. Governor." He retired from the university and ran for the job — only to lose, much to Truitt's satisfaction. Assuming his lab was safe, Truitt retired that year as director.

But the battles with Curley Byrd had not ended. After his defeat, Byrd was appointed Chairman and Director of the state's Tidewater Fisheries Commission and in those jobs he lobbied — again unsuccessfully — to bring the Chesapeake Biological Laboratory (CBL) under his department.

Truitt was gone but, according to *The Baltimore Sun*, scientists at the laboratory still opposed any connection with Byrd. The result was a turnabout: to escape Byrd, lab scientists now preferred to finally merge with the University of Maryland. In 1961 the Solomons lab became part of a new university program called the Natural Resources Institute. And in 1973, it became part of what is now the University of Maryland Center for Environmental Science.

Idealism sometimes carries a cost. Truitt created his lab by "selling" his vision that science could help save the Chesapeake, but he might have built faster and larger by cutting a deal with his own devil: namely Curley Byrd, the master deal maker of his era. When the university connection, long delayed, finally came, it proved important in transforming CBL from a small research group and summer teaching center into the kind of major marine science center that Truitt wanted from the start.

Byrd soon retired from his state jobs to run — unsuccessfully — for the U.S. Senate. Truitt retired to write a series of regional histories about the Eastern Shore and lead a campaign to turn Assateague Island into a national park.

And he never lost his love for lacrosse. In 1959 Truitt was elected to the National Lacrosse Hall of Fame. The award cited him as a player, as a coach, as a frequent official for lacrosse games, and as a key member of the U.S. Intercollegiate Lacrosse Association.

There is no record he ever accepted any pay in any of these roles.

— *fincham@mdsg.umd.edu*

Maryland Sea Grant College
4321 Hartwick Road, Suite 300
University System of Maryland
College Park, Maryland 20740

Address Service Requested

Non-Profit Org.
U.S.Postage
PAID
Permit No. 04386
College Park, MD

Chesapeake Quarterly is printed on recycled paper, processed chlorine free, using soy-based inks

MDSG Extension Leader Steps Down

Lipton Named Top Fisheries Economist at National Agency

Douglas Lipton, director of Maryland Sea Grant's Extension team, has stepped down from his position to pursue a new opportunity. He joins the National Oceanic and Atmospheric Administration (NOAA) as the senior research economist at the agency's National Marine Fisheries Service.

He will be missed in Maryland and beyond. "Doug is an icon in the Bay, both as a highly respected and valued economist and as Maryland Sea Grant's Extension program leader," said Troy Hartley, who directs Virginia's Sea Grant program.

Lipton has been with Maryland Sea Grant since 1988, first as a fisheries economics specialist and, since 1993, as the head of the Extension program. The program's agents and specialists reach out to government agencies and communities across Maryland to promote the restoration of the Chesapeake Bay and the well-being of local communities — whether it's by helping to improve the water quality of local streams or by aiding efforts to restore native oysters to the estuary.

Under Lipton's leadership, Sea Grant Extension grew from six staff members to the 13 on board today. Most of the new-

comers work on watershed restoration and the local effects of climate change. In all, the staff members hail from diverse fields and include experts in food safety, business, and aquaculture.

Now a fisheries economist, Lipton first got his start as a biologist, catching, weighing, and analyzing river herring from Virginia and other fish up and down the Atlantic Coast. But he had always been interested in what he calls the "human element" of fisheries — how healthy fisheries can impact local economies and vice versa. Throughout his career, Lipton has been a strong supporter of using results from social science research to inform decisions affecting the Bay's environment and surrounding human population.

In a project supported by Sea Grant, for instance, Lipton surveyed recreational boaters across Maryland to see how they add to the state's economy. He found that boaters generate an average of $1 billion per year for the region. But many boaters might also abandon their hobby if the Bay's water quality becomes too degraded, Lipton notes.

More recently, Lipton helped Maryland's Department of Natural Resources launch an innovative "buy back" program for commercial blue crab fishing licenses. By 2011, the state had purchased more than 700 licenses back from Marylanders, many of whom hadn't fished for crabs in years. In theory, those buy backs could limit the number of fishermen returning to the water now that the Bay's crab population has begun to recover from a lengthy decline; this reduction in fishing pressure could help keep the population from declining again.

"Doug has made a tremendous contribution to our understanding of fisheries economics in the Chesapeake Bay region and at the national level," said Fredrika Moser, director of Maryland Sea Grant. "We look forward to continuing our collaborations with Doug from his new position at NOAA and wish him every success."

— *Daniel Strain*

To see online articles and to send us your comments, scan the code at left or go to www.chesapeakequarterly.net
A Maryland Sea Grant publication • www.mdsg.umd.edu • Follow us on Facebook and Twitter