

# Zarnoch studies the health of our waters

## Dr. Aldemaro Romero Jr. *College Talk*

Some people look at scientists and think of them as narrowly focused on obscure issues, but that is not the case with Dr. Chester Zarnoch. “You’re not just exploring the biology and the chemistry associated with the problem you’re working on, but also thinking about social implications, about economic implications,” he says.

A native of Manhattan, Zarnoch has studied and worked his entire life in New York, from receiving his bachelor’s degree at Southampton College of Long Island University, his master’s in the philosophy of biology at the City University of New York (CUNY) Graduate Center, a master’s in biology from Brooklyn College, and his doctorate in biology also from the CUNY Graduate Center. Today he is an associate professor in the Department of Natural Sciences of the Weissman School of Arts and Sciences at Baruch College/CUNY.

That ample experience has prepared him to look at the world as a whole. “I really think that when you’re doing your doctoral work, you’re exploring an issue from all angles. When you take that interdisciplinary approach, you live thinking about your research project 24/7.”

One of his areas of research has to do with something that affects all of us: water quality. “I think the ability of living organisms to grow, survive, and reproduce in aquatic ecosystems depends on proper water quality. Since they’re filtering the water, if there are high levels of bacteria, they will assimilate and accumulate some of that bacteria, so they’re an indicator of sewage and other kinds of pollution,” says Zarnoch.

He doesn’t believe that an increase in the number of organisms that filter bacteria out of the water will work to clean up an aquatic environment like that of New York City. “I don’t think we want to look at filter feeders as a solution to water quality problems. For example, in New York City, one of the biggest challenges to water quality is combined sewer overflows and sewage releases into the estuary, along with wastewater treatment effluent. We can’t put out



Dr. Zarnoch at his lab.

Photo by Gulinoz Javodova

enough oysters to remediate what’s coming from those effluent sources. They can contribute to the cleanup and the restoration of the system, but we need to attack that problem at the source,” he emphasizes.

Another environmental threat that affects our waters is invasive species. “The zebra mussel was introduced from Asia into the Great Lakes and then it spread throughout North America. It’s all over the place now, and it causes damage in a number of ways. Ecologically, it competes with natural filter feeders, reducing the number of native species. Economically, it can be a challenge, because the zebra mussel will attach to hard substrates, becoming what’s called a fouling organism. They can attach to boats, docks, power plant intakes, and so they cause a tremendous amount of damage to infrastructure when they get into these systems.”

Zarnoch has also studied a bizarre-looking animal

we are all familiar with: the horseshoe crab. “They’re an amazing species, one of my favorite animals. They’re a living fossil 400-plus million years-old. They’re basically scavengers. They’ll eat clams and worms and detritus, whatever they can find.” Zarnoch says that their role in the ecosystem shouldn’t be overlooked. “They’re very much linked to bird populations. In the spring, horseshoe crabs will come up onto beaches and spawn. Females will crawl up onto the beach, usually with a male attached. The female will dig a nest to deposit the eggs, the male will fertilize the eggs, and they’ll move back out into the ocean or the bays on a receding tide. This happens every spring, and it’s just perfectly timed, at least on the East Coast of the United States, with bird migrations. So as birds are flying back north after the winter migration, they make stops along the way. A number of the stops line up with heavily-used

horseshoe crab beaches, Delaware Bay being a notable one. Here in New York we have Plumb Beach in Brooklyn, where I bring my students every year. The birds will stop along the way and feed on horseshoe crab eggs.”

Restoration ecology has become a buzzword that some people think can be the salvation of many damaged ecosystems; however, it’s easier said than done. “When you’re going to explore a restoration project, you need to consider how much the system has changed, whether it’s possible to restore it to what it was a number of years ago. In many cases, it might not be, and that might not be an ideal place to do a restoration project. On the other hand, you might be able to find locations where the conditions—hydrologic, ecological conditions—line up in a way that might allow a restoration project to occur.”

Zarnoch’s most recent project in this area is in Jamaica Bay. “These are salt marsh islands that have been disappearing over the last several decades. A number of government agencies have gotten together and rebuilt the islands. The question we had is: Will these restored salt marshes provide nitrogen removal services in New York City for our wastewater treatment plants? The next step for us is to explore how we can manipulate restoration design to enhance these processes. Right now we’re looking at design features, engineering features. We’re looking at species interactions that occur on the marshes so as to be able to inform restoration practitioners of how we can build these things to get the most out of them in terms of functional capacity.”

And Zarnoch concludes, “In New York, the single greatest challenge to our ecosystems is this issue of eutrophication. If we can understand denitrification and we can restore habitat that can provide this service, I think that it’ll help, in addition to the engineering upgrades that happen at wastewater treatment plants.”

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