

News | 02/19/2008

[Back to 2008 News Index ›](#)

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Contact: Elizabeth Boyle

University of Delaware Marine Public Education Office

Phone: 302-831-8083 | Email: [The Marine Public Education Office](#)



Three Sea Grants Team Up for Larval Study



CMES Professor Tim Targett and UMCES Assistant Professor Elizabeth North preserve samples for later inspection.

Photo by Tammy Beeson

Catherine House, a research technician working at the University of Delaware's Hugh R. Sharp Campus in Lewes, holds a larval fish — a tiny specimen smaller than a fingernail — in a pair of forceps and slowly raises it to eye level.

“This one looks like a croaker,” she says, rotating the instrument between her fingers and then dipping the fish into a Pyrex dish.

House, who works for UD's College of Marine and Earth Studies (CMES) and the Delaware Sea Grant College Program, has performed this action of identifying, measuring, and counting fish larvae hundreds if not thousands of times. She,

UD Professor of Marine Biosciences Tim Targett, and two of his graduate students have been sampling larval fish at the mouth of Delaware Bay for almost two years.

House knows first-hand how very repetitive science can be, but she has an impetus to continue cataloging — she's part of a tri-state team that is investigating how certain types of fish larvae come to the Delaware and Chesapeake estuaries after they've been spawned far offshore. Scientists from Delaware, Maryland, and Virginia are working together under a cooperative Sea Grant funding program that creates large-scale research programs by facilitating multistate collaborations.

Sea Grant is a national network of more than 30 university-based programs that is administered through the National Oceanic and Atmospheric Administration (NOAA). Each coastal state and each Great Lake state has a Sea Grant Program in which scientists participate in education, research, and outreach related to the use and conservation of aquatic resources. The Delaware Sea Grant program is housed at UD; Maryland's is at the University of Maryland Center for Environmental Science (UMCES); and Virginia's is at the Virginia Institute of Marine Science (VIMS).

Bringing together researchers from each of these institutions is a funding program that fosters collaboration instead of competition, the researchers said.

“Often researchers at different institutions compete because we write grants for the same federal funding. This is an unusual project because it mandates that scientists from different institutions work together,” said Assistant Professor Elizabeth North, one of several UMCES researchers working on the Maryland Sea Grant project.

Taking Stock of the Situation

The group’s work will help fisheries managers understand how changes in environmental conditions and climate influence water movement and the ingress, or entrance, of fish larvae from open ocean waters to the fertile area where bay and river waters are affected by the tides.

“We want to see if there are specific weather and hydrographic conditions that contribute to successful ingress of larval Atlantic menhaden, Atlantic croaker, and American eel into these estuarine nurseries,” Targett explained.

Fish can be transported into the estuaries by tides, by wind, or a combination of weather-related factors that vary from year to year. Those mechanisms also may differ between the two estuaries. With so many factors influencing the number of fish from year to year, it is difficult to know how many fish to harvest and how many should be left in the sea to spawn to ensure a healthy population and sustainable fishery.

And, say the researchers, the abundance of fish has changed, especially when they consider the effect of climate variability and fishing across the past couple of decades. Atlantic croaker have shown up in bigger numbers in the Chesapeake and Delaware Bays in the past two decades, UMCES researcher Edward Houde said. For menhaden, there has been a decline in recruitment in the Chesapeake, but apparently not in the Delaware. In the case of American eel, there is a continentwide decline in recruitments to estuaries.

“We want to know how much of the variability in fish populations is due to human activities such as fishing and how much is due to environmental changes,” North explained. “In addition to supporting more informed harvest decisions, this information will help us understand how climate change will influence fish populations and the seafood industry that relies upon them.”

By Land and By Sea

But how do the scientists determine how many fish there are and what the water conditions are like? They began tackling this question two years ago. In addition to the weekly samples Targett and his team have been taking from a CMES pier at Roosevelt Inlet, in closely coordinated efforts, scientists with the other two Sea Grant programs have been sampling and recording the physical conditions of the water.

This winter, a series of cruises on the UD research vessel RV Hugh R. Sharp are linking and enhancing all of these endeavors — and producing stacks of sample jars awaiting sorting back at the lab.

During a cruise at the mouth of Delaware Bay, North noted that it is expensive — about \$12,000 a day — to operate the ship, and federal funds (from NOAA) for “big boat” ship time have been a real boon to this research program.

“We’re really lucky to be out on this ship,” she said, adding that the cruises let the team determine the accuracy of the pier sampling when they compare it to the data taken from the ship.

North also pointed out that the cruises allow the researchers to collect samples and data in a short period of time and from across the entire mouth of both bays. The size of the RV Sharp (146 feet) and the number of skilled crew allow the scientific team to conduct 24-hour operations during the research cruises.

That means each cruise brings a flurry of round-the-clock activity, including sampling for fish larvae and measuring water characteristics.

Once they reach their destination — day or night — cruise participants fall into a pattern. The RV Sharp pulls a large specially designed net known as a Tucker Trawl at designated locations for several minutes to collect fish larvae. Then the team goes to work pulling the trawl onto the ship, rinsing off the samples and preserving them in ethanol. While the researchers on the ship take samples, those back at the Virginia and Delaware Sea Grant pier stations also take samples so the data can be compared.

The ship's crew also deploys a device called a Scanfish and another called a CTD to provide the researchers with data on water characteristics such as salinity, temperature, and depth. Once all the fish larvae samples are sorted and counted, the scientists will be able to relate fish numbers and sizes to the physical conditions of the water. They will link this information with historical data and numerical models and provide to fisheries managers a new understanding of why croaker, menhaden, and eel populations vary.

Better Together

Conducting science operations on the bay with winter winds whipping across the deck of the RV Sharp is cold enough to make your eyes water. But for the scientists it's a memorable experience. For many of them, this is the first time working together on a Sea Grant project.

Targett said he's pleased with assembling a team in which each member can contribute expertise to a research goal larger than any one of them could address individually. He also said that working together has extended the geographic area the researchers can cover.

North agreed and added that the grant they're working under has fostered collaboration instead of competition — and that's a good thing, she said.

"It's exciting to go outside your comfort zone," she said.

To learn more about the larval ingress project, visit http://northweb.hpl.umces.edu/Ingress/Larval_Ingress.htm. To read about life as the captain of the *Sharp*, go to <http://www.ocean.udel.edu/news/article.aspx?473>.

For information about Delaware Sea Grant, visit www.ocean.udel.edu/seagrant. For Maryland's and Virginia Sea Grants, visit www.mdsg.umces.edu and www2.vims.edu/seagrant.

For more on UD's College of Marine and Earth Studies, visit www.ocean.udel.edu.