Northeast Fisheries Science Center

Science Spotlight

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New York High School Student Teams with NOAA Researcher, Makes Promising Contribution to "Red Tide" Research

For the past three years, Byram Hills High School student Kristy Gardner of Bedford, N.Y. has been focused on a tiny organism that causes a type of harmful algal bloom, commonly called red tide, that affects shellfish in Gulf of Maine and New England waters. The blooms can have devastating human health and economic impacts, but much remains unknown about how the organism reproduces and survives the winter.

Gardner was curious, and at the end of her sophomore year decided to team up with biologist Gary Wikfors of NOAA's Northeast Fisheries Science Center laboratory in Milford, Conn. There, she conducted original research on harmful algal blooms as a participant in the high school's Dr. Robert Pavlica Authentic Science Research Program.

The research program was founded in 1990 by a member of the Armonk, N.Y. school's staff who believed schools need to make science "authentic" by providing hands-on activity for students. The Pavlica Authentic Science Research Program helps high school students learn the fundamentals of scientific research and presentation of results by participating in a research project of their choosing under the guidance of a scientist or mentor they also choose and their classroom teacher.

The result of Gardner's efforts: an unexpected and potentially significant research finding about reproduction of the harmful algal bloom species *Alexandrium fundyense.* Gardner is also the 2008 recipient of the Dr. Robert Pavlica Authentic Science Research Program Award, and a 2008 semifinalist in the prestigious Intel Science Talent Search.

"When Kristy first contacted me about working on a project in my lab, I tried to say 'no' several times, not because I was unsupportive, but just because it seemed like too much driving between Armonk, New York and Milford - over an hour – for a high school science project," Wikfors said. "Kristy was persistent and very convincing, and after I learned about the sophistication of the program, her parents' commitment to the driving, and mostly Kristy's strong motivation and quick intellect, I said okay."

Gardner convinced Wikfors to take her on as a summer volunteer after her sophomore year of high school, working full-time at the Milford Laboratory, which focuses on aquaculture and related science. She learned how to conduct a scientific

study and the methodology involved, researched the scientific literature and read articles on harmful algal blooms, and with Wikfors' guidance developed a research focus to pursue. Last summer, she conducted a laboratory experiment on the effects of nutrient deficiency and autoxicity in *Alexandrium fundyense*, then spent her senior year analyzing the data, writing up her findings and presenting them to her class.

Wikfors says he believes people rise, or sink, to expectations, so he treated Gardner like a graduate student, postdoctoral researcher or professional colleague. He provided technical training, access to all the lab's advanced technologies, and "only as much guidance as she seemed to need" to pursue her own interests in red tide ecology. She worked independently, with some help from other lab staff, to produce data that she and Wikfors used to ask the questions that first motivated her to pursue the research. The results were startling.

"Kristy's study provides strong evidence that red tide populations play an active role in modifying their environment to control their own reproductive cycles, rather than simply responding to external changes in water chemistry," Wikfors said. "This finding contributes to a very new view of dinoflagellate ecology that has emerged only in the last two years, and will represent a significant contribution to the literature on harmful algal blooms."

Gardner presented her research results at the Byram Hills Science Research Symposium June 4, with Wikfors in attendance as she was presented the 2008 Robert Pavlica Award for her efforts. More than 120 students at the school participated in the science research program this past year, and more than 170 schools in the state and schools in four other states follow the Byram Hills program model.

"I consider myself incredibly fortunate to have been able to work under Gary Wikfor's guidance for the past three years. I've grown both as a scientist and as a person," Gardner said. "It's wonderful to know that there are researchers who are eager to support young people's scientific endeavors. I am thrilled to know that my research will contribute to the field's knowledge, but more importantly, my experience has furthered my interest in conducting research in the future."

What's next? Gardner graduated from high school June 24, and plans to work with Wikfors over the summer to turn her student research report into a professional article they plan to submit to a scientific journal. In the fall, she heads to Amherst College, where she plans to major in math.

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On the web:
NEFSC's Miklford Laboratory: http://mi.nefsc.noaa.gov/

Dr. Robert Pavlica Authentic Science Research Program
http://query.nytimes.com/gst/fullpage.html?res=9404E7D6163EF937A35751C0A9679C8B63