

Priming the

DEAD ZONE

Newly discovered winter alga may be linked to Lake Erie's summertime event

by Stacy Brannan, Ohio Sea Grant Communications

With the winds howling and snow falling, it seems like few microscopic creatures could survive a winter in Lake Erie. But Ohio Sea Grant researchers Drs. Michael McKay, George Bullerjahn, and Scott Rogers of Bowling Green State University have discovered life under the icy surface in the form of the diatom *Aulacoseira islandica*—and they believe it may even be contributing to that summertime phenomenon, the Dead Zone.

McKay and Bullerjahn discovered the cold-loving algal plankton in Lake Erie by accident while onboard a Canadian Coast Guard icebreaker with New York Sea Grant researchers Michael Twiss and Steve Wilhelm in February 2007. “Apart from Professor David Chandler’s pioneering research in the late 1930s, to our knowledge there had been little done to study Lake Erie, its microbiology, and plankton in the winter months,” McKay says. “Our plan was to go, do some sampling, and see what was out there. We had no expectations of what we would find.”

What they found were pockets of brownish-looking water, some the size of swimming pools and some that stretched for kilometers. At first they suspected it might be stirred-up sediment, but their testing proved otherwise.

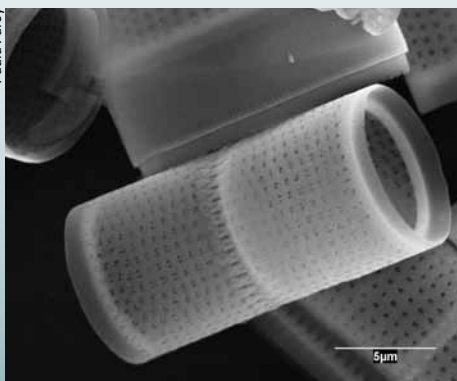
“I think a lot of people assume the lake is dormant in the winter,” Bullerjahn surmises. “As biologists, we knew that wouldn’t be true, but we were not prepared for the outcome: large accumulations of healthy diatoms under the ice, causing the ice to look brown.” It turned out that 80% to 90% of the biomass in those discolored water samples was *Aulacoseira*

islandica, a psychrophilic, or cold-adapted, diatom that can survive in low light and seemingly disappears when spring rolls around. “They don’t seem to be present once the water warms up,” McKay explains.

So, how might diatoms that thrive in the winter influence a Dead Zone that occurs in July and August? It all has to do with their life cycle.

The *Aulacoseira* appear to be able to maintain their position just below the surface of the ice, where they are able to absorb sunlight and multiply. What McKay and Bullerjahn want to know is what happens next. Are they eaten by zooplankton and other organisms? Or do they die and sink to the bottom of Lake Erie?

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Ohio Sea Grant researchers Drs. Michael McKay and George Bullerjahn have discovered large, brownish blooms of the diatom *Aulacoseira islandica* thriving under Lake Erie’s ice. Making up nearly 90% of the algal biomass, these cold-adapted plankton could be the bacteria’s fuel that sparks Lake Erie’s Dead Zone in the summer.

“If it turns out that most of these diatoms end up on the lake floor, they would provide a large source of organic carbon for bacteria to decompose, which would consume oxygen,” McKay says. “If this decomposition happens mainly when the water warms up and stratifies—forming a warm upper layer and a cold lower layer in the summer months—and not during the frigid winter months, it has to be contributing to the Dead Zone.”

To test this theory, the group will use Sea Grant funding to collect data for the next two winters, including taking part in several more science cruises. In addition, Environment Canada will use its icebreaker to deploy sediment traps that will sit on the bottom of the lake during the coldest months of the year, which should help determine if the diatoms are indeed sinking to the bottom of the lake.

If the blooms are occurring because of high nutrient levels in the water, it would be essential to track and potentially limit the source of those nutrients. Other theories point to the zebra mussel invasion as the trigger for *Aulacoseira*’s growth because of the mussels’ ability to increase levels of dissolved silica, a nutrient needed in large amounts by the algae. Certainly, McKay and Bullerjahn and their newly discovered, winter-loving diatom are poised to shake up the traditional models that considered Lake Erie more or less dormant from November through March. Preliminary data should be available in Summer 2010.

For more about this Sea Grant-funded research, contact Dr. Michael McKay at rmmckay@bgsu.edu or Dr. George Bullerjahn at bullerj@bgsu.edu. TL