Courtesy of U.S. Geological Survey

Zebra mussels have spread throughout eastern North America, changing the aquatic ecosystems they inhabit.

Musseling In

Zebra mussels first took up residence in the Great Lakes about 15 years ago after hitching a ride from eastern Europe in the ballast of a ship that discharged them into their new environment. Since then, the bivalve mollusks have made themselves at home, spreading prolifically to inland waters and establishing themselves as a permanent presence in Central New York and eastern North America. "Zebra mussels are totally different from anything else in freshwater," says biology professor Christine Mayer, who has studied them for several years with colleagues at the Cornell Biological Field Station on Oneida Lake, north of Syracuse. "When they were introduced, it wasn't like replacing one predator with another. They filled a niche."

Wherever the water-filtering mollusks have ended up, Mayer says they've had one consistent impact: increased water clarity. That result, in turn, can affect an entire aquatic ecosystem, as clarity allows light to penetrate deeper into the water, stimulating the growth of algae and other plants associated with the bottom and changing the habitats of fish and other species.

Mayer, however, points out that invasive, exotic, or introduced species are nothing new to the Great Lakes. According to one study, as of 1999, an estimated 160 exotic species had entered the Great Lakes during the past two centuries. Some species, such as salmon and alewives, were intentionally introduced through stocking programs, while others, like the Eurasian ruffee and quagga mussel (a relative of the zebra mussel), were trespassers. "There aren't many success stories about preventing the spread of invasive species," Mayer says. "The best way to stop an invasion is to prevent introductions, which is tough to do."

Last fall, Mayer and student research assistant Jacki Philippon '03 found a tiny Eurasian crustacean known as *Echinogammarus* in Oneida Lake. Like the zebra mussel, this exotic species most likely arrived in the Great Lakes as a ballast stowaway, flourished in its adoptive habitat, and spread. Mayer, Philippon, and Cornell professor Nancy Tisch are studying the creature in hopes of determining whether it competes with native freshwater shrimp species and plays a similar role in the food chain. "The native amphipods [freshwater shrimp] are important fish food," Mayer says. "So far we don't have any strong evidence that this new species is hurting the native one. But a lot more crustaceans will probably show up. Some may be predatory and could change everything. They could eat all the native amphipods and leave nothing for the fish, so it's important to understand how the community works and how things are connected."

For Mayer, that connection begins at the lake bottom, where many of these species dwell. As part of a project examining changes in benthic (bottom) activities and processes, Mayer is doing field and lab research with Philippon and SU graduate students Rebecca Johnson, Bin Zhu, and Peibing Qin. What they ultimately learn about such issues as the changes in water clarity and light, the production of benthic algae and other plants, and the impact on the food chain may be crucial to understanding the puzzle created by invasive species entering a new territory. "Exotic species are making a lot more happen on the bottom, including possibly switching the food web to have more importance associated with the bottom," Mayer says. "I don't want to pass moral judgment on a bivalve mollusk or any other species. I just prefer to say these species are here—like the weather—and we have to deal with them."

—Jay Cox