Rhode Island Sea Grant
FACT SHEET

Zebra Mussel: An Unwelcome Visitor

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Zebra mussels (*Dreissena polymorpha*) are tiny black-and-white striped bivalve molluscs (relatives of clams and oysters) that are new invaders to North American freshwater and estuarine systems. These pesky mussels have caused millions of dollars of damage in the Great Lakes region alone. The invasion of the zebra mussel into the Great Lakes has not only created a serious economic problem, but also threatens to disrupt aquatic communities throughout most of North America.

INVASION IN NORTH AMERICA

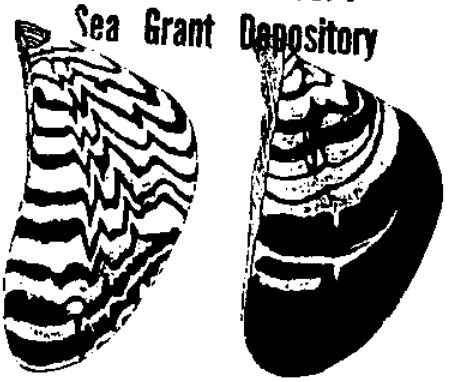
Zebra mussels are native to western Asia and were indigenous to the drainage basins of the Aral, Black, and Caspian seas. During the 1700s, zebra mussels invaded many freshwater bodies in eastern Europe, particularly, the Mazurian lakes in northeastern Poland. A century later, they invaded rivers, lakes, and water canals of the Netherlands. Presently, zebra mussels exist throughout most inland water systems in Europe. The actual pathway of the zebra mussel's introduction into the United States is not completely known. However, biologists speculate that zebra mussels probably were introduced into North America during the mid-1980s by a European cargo ship that discharged ballast water into the Great Lakes. In 1988, the first zebra mussels were discovered in the Great Lakes basin in Lake St. Clair. Since their initial discovery in 1988, zebra mussels have spread throughout all the Great Lakes and into the St. Lawrence Seaway. By 1992, they had been found as far north as Wisconsin and as far south as Arkansas in the Mississippi River and its tributary system. Recently, zebra mussels have extended their range to the Mohawk and Hudson rivers of New York and are expected to invade New England waters by 1993.

WATCH OUT FOR HITCHHIKERS

Although zebra mussels can be transported naturally via water currents and waterfowl, it is believed that the rapid expansion from the Great Lakes to other inland freshwater systems is attributed to dispersal influences through human activities. Transportation of zebra mussels from infested waters to noninfested waters can occur by boats, trailers, and anglers. Juvenile and adult mussels attach themselves to ship and recreational boat hulls and trailers. However, the microscopic mussel larvae can easily be transported in ballast water, boat bilge, engine cooling systems, bait buckets, and live wells. This inadvertent transportation of larval mussels has likely enhanced the bivalve's dispersion and rapid expansion into noninfested inland waters of the United States.

IS THAT A ZEBRA MUSSEL?

Zebra mussels look like small clams with elongated yellow and/or brown "D" shaped shells. They are usually marked with alternating light and dark herringbone bands, but the number and pattern of the bands or stripes is highly variable. Most zebra mussels are thumbnail size, but some grow up to 2 inches long. Zebra mussels grow in dense clusters that contain numerous individuals attached firmly to surfaces by strong adhesive threads called byssal fibers.



[From: Morton (1969)]

These mussels will attach and colonize on almost any surface type—metal, rubber, glass, cloth—but have been a problem particularly in utility plant intake pipes, which have a constant water current important for mussel growth. This often results in drastically reducing the water flow into the plants. Colonies of zebra mussels can also be found along lake shores, riverbanks, and piers. And mussels will attach to aquatic plants, rocks, floating debris, other bivalves, and crustaceans. Reports of zebra mussel densities along many shallow areas of Lake Erie exceeds 30,000 per square meter. European studies have reported very high colony densities that exceed 100,000 mussels per square meter.

BIOLOGY

Zebra mussels, like other bivalves, are filter feeders. Phytoplankton, microscopic algae, and organic debris are siphoned in and filtered by the mussel's ciliated gills. Reports indicate that the average zebra mussel can filter one liter of water per day. Since its introduction

What Rhode Islanders Can Do

As of early 1993, no zebra mussels have been found in R.I. waters. However, zebra mussels have rapidly expanded their range and are predicted to invade New England waters. Ultimately, zebra mussels will infest most regions of North America. They could threaten local water supplies and become a costly nuisance to boaters, anglers, and industries. It is possible to slow the spread of zebra mussels into New England waters by becoming aware of how these mussels disperse themselves through human activities. Boaters or anglers may inadvertently transport zebra mussels from infested freshwater bodies to noninfested inland lakes and rivers. In an effort to control zebra mussels from spreading to R.I. waters, take the following precautions after boating or fishing in infested waters:

1. **INSPECT** and **CLEAN** any zebra mussels and aquatic vegetation from the boat hull, trailer, anchor, anchor rope or chain, and motor. If you see any "hitchhiking" zebra mussels, scrape them off and discard in a trash can.

2. **DRAIN** all water from the boat and its components. Before leaving the infested area, drain bilge water, live wells, bait buckets, and engine cooling water.

3. **DRY** the boat, trailer, and equipment. Allow the boat and trailer to dry thoroughly in the sun before transporting to noninfested waters. If it is hot and dry, leaving the boat out of the water for two to four days will effectively kill the mussels.

4. **LEAVE** any live bait behind. Bait used in infested waters should not be transported to noninfested waters. Give the bait to someone headed out on the body of water you are leaving, or discard at the boat launch.

into the Great Lakes, researchers and residents have noticed a dramatic increase in water clarity due to the mussels' filtering of particles from the water. But filtering may also reduce the availability of food to other aquatic organisms. It is uncertain what impact zebra mussels will have on the food chain in heavily infested lakes and ponds.

Zebra mussels spawn twice per year—in late July and late August. The average female zebra mussel can release up to 100,000 eggs per year. Once fertilized, the egg will hatch within days and develop into a free-swimming planktonic larva called a veliger. The microscopic veligers are transported by the water currents and, in some instances, inadvertently by man.

Zebra mussels are able to tolerate a wide range of environmental conditions, but colonization appears to be determined by depth, water temperature, and salinity. Most mussel colonies grow at depths of 2 to 7 feet, but some Great Lakes researchers have sighted mussels at depths of 180 feet. Zebra mussels actively feed and spawn as water temperatures reach 54 F, but can tolerate temperatures ranging from 45 F to 90 F. One of the most important conditions limiting the zebra mussel's expansion is salinity. While primarily a freshwater species that lives in salinities of 0.21 to 1.47 parts per thousand (ppt), zebra mussels can tolerate salinities up to 13.40 ppt, typical of estuarine systems.

Although many aquatic organisms—fish, waterfowl, crayfish, and zooplankton—are known to prey on adult and larval zebra mussels, the impact on the mussel population is insignificant. It is also unlikely that zebra mussels will be utilized for human consumption. Aside from being too small and difficult to harvest, zebra mussels serve as parasite vectors and may accumulate toxins.

IMPACT OF ZEBRA MUSSELS

Within the Great Lakes region, the zebra mussel infestation has created a severe economic problem. Zebra mussels have had a tremendous impact on facilities that use raw surface water, such as utility plants, factories, and water treatment plants. These mussels will attach and colonize inside water intake pipes, wells, and screen systems. In addition to clogging pipes and reducing the flow, zebra mussels infiltrate interior plant structures, causing obstruction of pump valves and leading to failures of vital plant components. This scenario occurred at the Monroe waterworks plant on Lake Erie. As a result, the 24,000 residents of Monroe, Mich., experienced several water outages during 1989 to 1991. The estimated cost of the infestation was $300,950—44 percent of which went to cleaning of intake pipes and research and engineering studies.

The zebra mussel infestation has also had a major impact on recreational water use. Boat and marina owners have had to find ways to remove the encrusted mussels from their boat hulls, piers, and moorings. And in recreational areas, the smell of dead, rotting mussels has driven beachgoers away. Great Lakes officials estimate that as much as $5 billion over the next decade will be spent on zebra mussel control.

WHETHER YOU FISH, SWIM, OR BOAT, KEEP ON THE LOOKOUT FOR THESE PESKY BIVALVES. REPORT ANY SIGHTINGS OF ZEBRA MUSSELS IN R.I. WATERS BY CONTACTING THE R.I. DEPARTMENT OF ENVIRONMENTAL MANAGEMENT AT (401) 789-3094.

For Further Reading:

Nalepa, F.T., and D.W. Schloesser. 1993. *Zebra Mussels: Biology, Impacts and Control*. Lewis Publishers, Boca Raton, Fla. 810pp.

O'Neill, C.R., Jr., and D.B. MacNeill. 1991. The Zebra Mussel (*Dreissena polymorpha*): An Unwelcome North American Invader. New York Sea Grant Institute. 12pp.

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