



US Army Corps  
of Engineers  
Waterways Experiment  
Station

# Zebra Mussel Research

## Technical Notes

Section 2 — Control Methods

Technical Note ZMR-2-13

November 1992

### Use of Decreased Air Pressure under Laboratory Conditions to Increase Zebra Mussel Mortality

- Background and purpose** Aerial exposure and artificial creation of anoxia by sealing water pipes have been recommended as strategies to control zebra mussels (Miller, Payne, and McMahon 1992, Lyakhov 1964). However, these strategies require prolonged shutdowns because mussels can survive for a long time in humid conditions and their oxygen consumption rates are low. The use of a vacuum, which reduces oxygen tension, has been shown to increase the mortality of zebra mussels under laboratory conditions.
- Additional information** This technical note was written by Mr. Lei Jin, U.S. Army Engineer Waterways Experiment Station (WES). For more information, contact Dr. Barry S. Payne, (601) 634-3837, or Dr. Andrew C. Miller, (601) 634-2141. Dr. Ed A. Theriot, (601) 634-2678, is Manager of the Zebra Mussel Research Program.
- Research results** Results of a laboratory experiment demonstrated that zebra mussels, when exposed to the air at 20 degrees Celsius, were killed much more rapidly at reduced pressure than at normal atmospheric pressure (Figure 1). Zebra mussels have some capacity for respiration in moist air. Under normal pressure they survived for 7 days. When a pressure of -12 pounds per square inch (psi) was applied continuously to an experimental chamber, aerially exposed zebra mussels died within 3 days. With pressure reduction, oxygen became less available, respiration less efficient, and death was more rapid than at normal pressure.
- Recommendation** Maintaining negative pressures of -12 psi for 3 days was required to cause nearly 100 percent mortality. Mortality would probably be even more rapid at pressures less than -12 psi. Mortality of mussels in oxygen-deficient conditions increases as water temperatures increase. Therefore, using a vacuum pump to remove air from a pipe or other closed system to kill zebra mussels would be most efficient if applied during summer months.
- Cost savings** In addition to the lack of any negative environmental effects of this technique, the use of a vacuum reduces the time required for atmosphere exposure (and desiccation) to kill zebra mussels. Reduced facility shutdown has economic benefits.

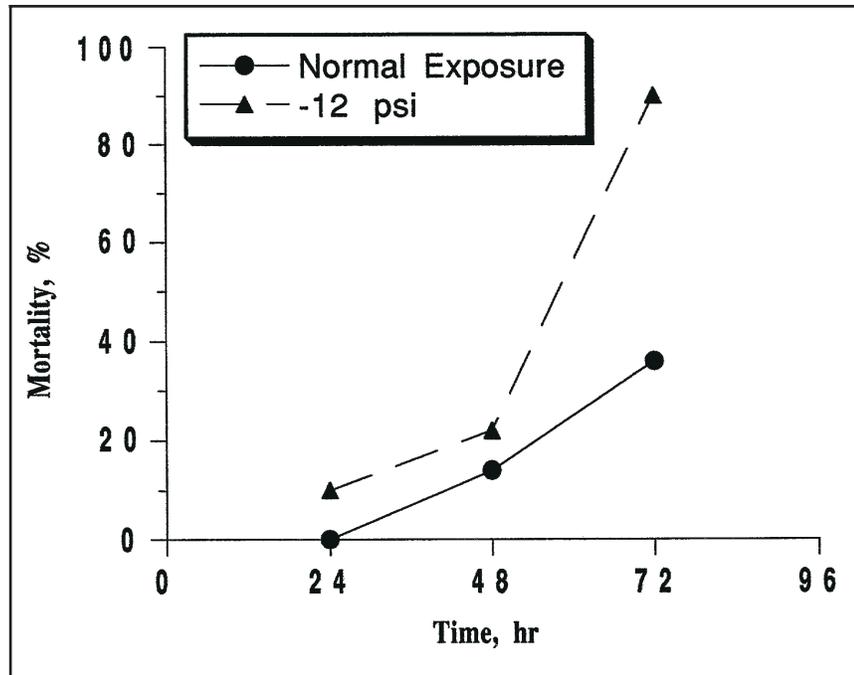


Figure 1. Aerial exposure

**References** Lyakhov, S. M. 1964. "Work of the Institute of Biology of Inland Waters, Academy of Sciences of USSR," B. K. Shtegman, ed., *Biology and Control of Dreissena*, Trudy Institute Biologii Vnutrennikh Vod, Akademia Nauk SSSR, Vol 7.

Miller, A. C., Payne, B. S., and McMahon, R. F. 1992. "Zebra Mussel: Biology, Ecology, and Recommended Control Strategies," Technical Note ZMR-1-01, Zebra Mussel Research Program, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.