



US Army Corps
of Engineers
Waterways Experiment
Station

Zebra Mussel Research

Technical Notes

Section 1 — Environmental Testing

Technical Note ZMR-1-19

May 1994

Procedure for Measuring the Force Required to Remove Zebra Mussels from Substrate

Background and purpose Zebra mussels attach to substrates such as polyvinyl chloride (PVC), Plexiglas, stainless steel, and aluminum, as well as natural substrates such as rocks, aquatic and woody vegetation, and other mussels. The attachment rate and the forces required to dislodge mussels vary depending on substrate type.

A method of measuring the force required to remove mussels from various substrates can be used to develop strategies for eliminating these pests from locks, dams, hydropower stations, and pipes and valves in municipal water supplies. The effects of different types of coatings on the strength of attachment could be tested.

This technical note describes the use of a digital force gauge to measure the force needed to remove attached zebra mussels.

Additional information This technical note was written by Ms. Erica Hubertz, University of West Florida. For additional information, contact Dr. Barry S. Payne, (601) 634-3837, or Dr. Andrew C. Miller, (601), 634-2141, U.S. Army Engineer Waterways Experiment Station (WES). Dr. Ed Theriot, WES, (601) 634-2678, is Manager of the Zebra Mussel Research Program.

Use of digital force gauge The force gauge was mounted to a stand with a moveable base (Figure 1). A modified caliper secured to the gage was attached to a zebra mussel. The test substrate with zebra mussel attached was secured to the base (Figure 2). The base was slowly lowered, and the gauge recorded the peak force in kilograms before the mussel detached (Figure 3).

The gauge was used to measure the average force required to remove mussels from PVC at different times following attachment (Figure 4). There was a gradual increase in force through time with an average peak force at week 4. This relationship would differ depending on various external conditions such as water temperature, water velocity, and food availability.

The digital force gauge (with stand) is portable and is powered by battery or 110-V AC. It can be connected to a computer to transfer data. The gauge is manufactured by Chatillon, 7609 Business Park Drive, Greensboro, NC 27409.



Figure 1. Digital force gauge

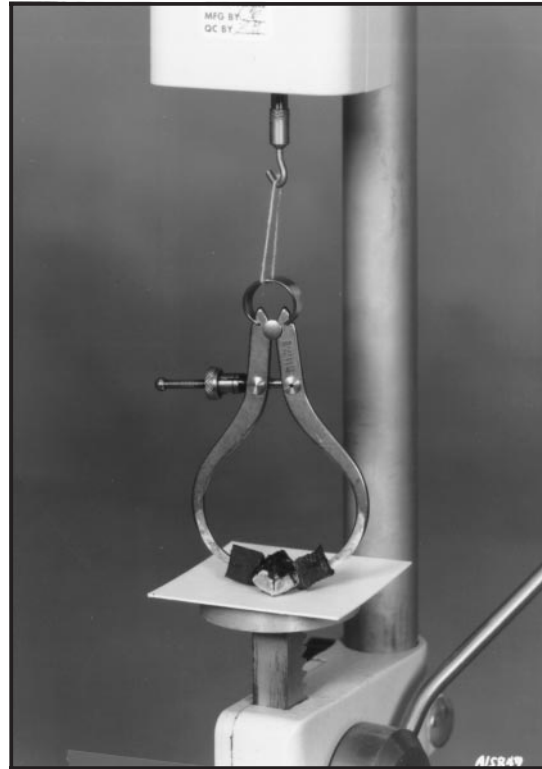


Figure 2. Use of the force gauge

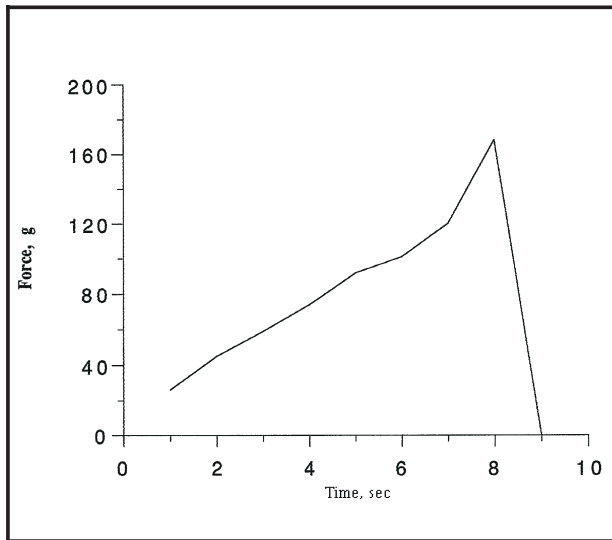


Figure 3. Force required to remove a zebra mussel from PVC substrate

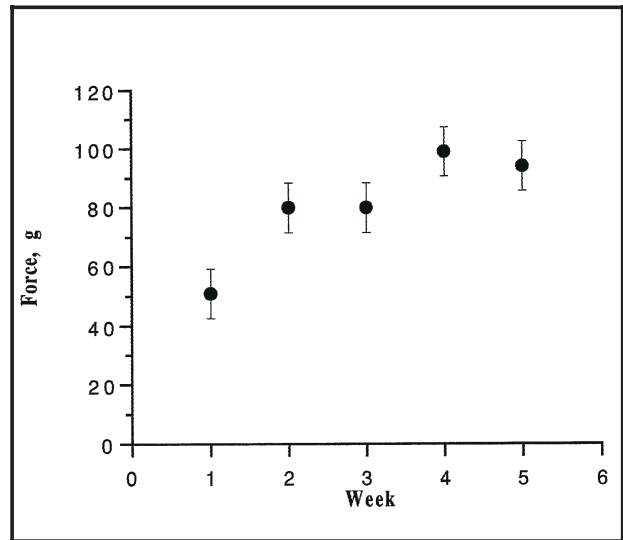


Figure 4. Relationship between time and the average force required to remove zebra mussels from PVC substrate