



US Army Corps
of Engineers
Waterways Experiment
Station

Zebra Mussel Research

Technical Notes

Section 4 — Miscellaneous

Technical Note ZMR-4-02

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A Method for Calculating the Total Mass of Zebra Mussels

Background and purpose

A heavy infestation of zebra mussels could add considerable weight to structural components of locks, dams, or other public facilities. This increased weight would be of special concern for winch motors or gates designed to operate with a predetermined load. The following technical note describes the relationship between shell length (SL) of zebra mussels and total mass both above and below water. In addition, conversion factors are provided so that total mass of zebra mussels can be determined from an estimate of their total volume.

Additional information

This technical note was written by Dr. Andrew C. Miller and Mr. Jin Lei, U.S. Army Engineer Waterways Experiment Station (WES). Contact Dr. Miller, (601) 634-2141, for additional information. Dr. Ed Theriot, WES, (601) 634-2678, is Manager of the Zebra Mussel Research Program.

Morphometric measurements

The relationship between SL and total mass of zebra mussels in and out of water was determined by grouping similarly sized individuals, ranging from small to large size, and then calculating an average mass for each group. The relationship between SL and volume of water displaced was also estimated. Exponential equations for these relationships, with X = SL and Y = mass or volume, are

$$\text{Mass to SL: } Y = 0.010114 * e^{(0.23081X)} \quad R = 0.95$$

$$\text{Mass in water to SL: } Y = 0.002307 * e^{(0.24966X)} \quad R = 0.96$$

$$\text{Volume to SL: } Y = 0.008189 * e^{(0.23324X)} \quad R = 0.99$$

Conversion factors were then prepared so that total mass of zebra mussels (in kilograms or pounds) could be calculated based on an estimate of total volume. In the following examples, the volume of a population of zebra mussels was multiplied by an appropriate conversion factor to obtain estimates of mass in and out of water. The population consisted of equal number of adults (individuals with SL greater than 10 mm, or 0.4 in.) and juveniles.

Condition	Conversion Factor	Volume	Estimated Mass
Mass in water	(SI) 0.34	20,000 cm ³	6,800 g (= 6.8 kg)
	(Non-SI) 0.20	1,296 in. ³	259 oz (= 16 lb)
Mass out of water	(SI) 1.20	20,000 cm ³	24,000 g (= 24 kg)
	(Non-SI) 0.70	1,296 in. ³	907 oz (= 57 lb)

Notes: 20,000 cm³ of zebra mussels would be equivalent to 1 sq m with thickness of 2 cm.
 1,296 in.³ of zebra mussels would be equivalent to 1 sq yd with thickness of 1 in.

Conclusions The above relationships can be used to estimate total mass of zebra mussels in or out of water. These factors were developed for populations consisting of approximately equal numbers of juveniles and adults. These conversion factors will also apply to populations dominated by either adults or juveniles. This information can be used to estimate the total mass of a known volume of zebra mussels on a structure.