COOPERATIVE EXTENSION SERVICE Mississippi State University

For Fish Farmers

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WHAT EVERY FISH FARMER SHOULD KNOW ABOUT ZEBRA MUSSELS

For the most part, fish farmers are hard working, "bottom line" folks. That is particularly true when it comes to potential pests like the zebra mussel. Given five minutes to read an article about zebra mussels, most fish farmers would probably like the following questions answered:

1) What are they?
2) How will they affect me?
3) How can I keep them out of my facility?
4) How can I control them once they get in?

Zebra Mussel Facts

* The zebra mussel is a freshwater clam native to the Caspian Sea of western Russia.

* First discovered in 1988 in the Great Lakes region, it has spread at an alarming rate throughout the eastern North American continent and has been reported as far south as New Orleans.

* A single mature female zebra mussel can release over a million eggs in a season.

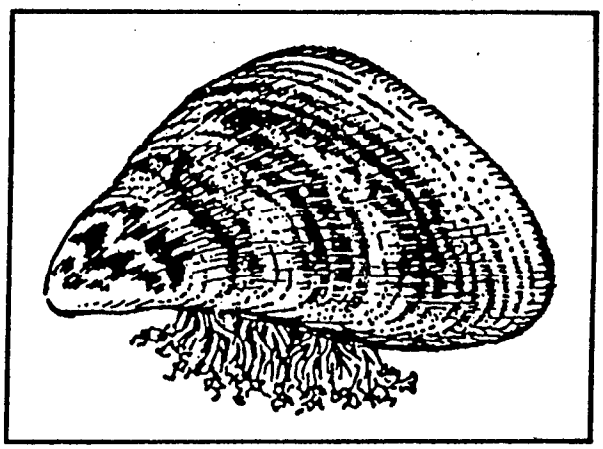


Figure 1. Adult zebra mussel (*Dreissena polymorpha*)

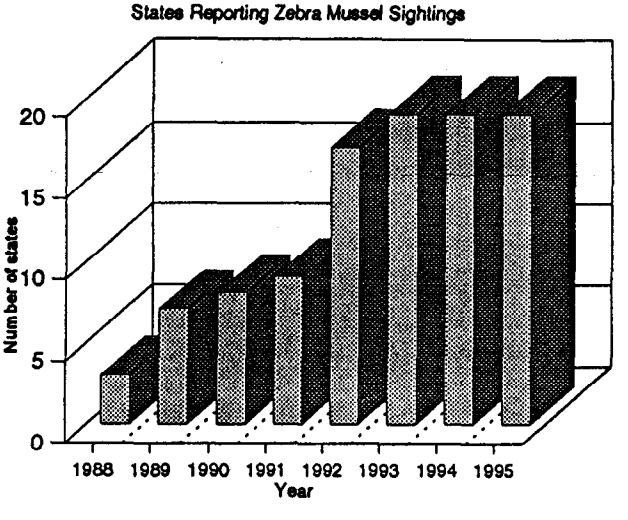
* Because of its diverse genetic background, the zebra mussel is highly adaptable to a wide range of environments.

* Densities approaching 100,000 ft^2 and 10 inches thick have been reported in industrial water intake pipes.

* Cost to fishermen and consumers in the Great Lakes region is estimated to be 5 billion dollars by the year 2000.

Impact On Fish Farmers

The greatest physical impact that the zebra mussel will have on fish farmers is as a macrofouler. Hatcheries, raceways, intensive recirculating systems and holding facilities will probably sustain most of the anticipated damage. Zebra mussel will clog filters, screens, cages and pipes. Zebra mussels have been identified as the intermediate host for at least one species of parasitic trematodes which can infect cultured fish species. Zebra mussels have also been found to be attached to aquatic plants such as coontail, hydrilla, Naiad and milfoil and have the potential of surviving in mud-bottomed aquaculture ponds having macrophytes. Because they are highly efficient filter feeders, dense populations of zebra mussels in ponds could conceivably reduce primary production such that fry and fingerlings are literally starved to death.



Preventive Measures

The adage, "An ounce of prevention is worth a pound of cure" could never be truer when it comes to zebra mussels. Once established, zebra mussels can be difficult, costly and sometimes impossible to eradicate. Here are steps you can take to protect your operation:

KEEP OUT CONTAMINATED EQUIPMENT AND FISH SHIPMENTS. Zebra mussels can enter your facility either as microscopic larvae transported in water, or as adults attached to boat hulls, motors, trailers, harvesting baskets or catfish holding socks. Strictly prohibiting boats and other equipment from contaminated waters onto your property can eliminate most sources of zebra mussels. Allow only shipments of fingerlings and brood stock from operations which are certified zebra mussel-free.

CLEAN, DRY AND QUARANTINE. Steam clean or immerse in hot water (140°F) for at 3-4 minutes, dry and quarantine all contaminated equipment that comes on your premises. This includes seines, nets, buckets, hauling tanks, pumps, etc. Bulky equipment like seines should be spread out in the sun for 3-4 days since adult zebra mussels can live more than a week out of water in warm, moist areas.

REMOVE AQUATIC WEEDS. Remove, inspect and properly dispose of aquatic weeds that inadvertently are carries into your facility.
Don't allow either of these pests to become established in your ponds.

PROTECT YOUR WATER SUPPLY. Since most surface waters will eventually be infested by zebra mussels, fish farmers should use ground water from a well or spring where feasible. Water taken from creeks or rivers should be filtered using sand filters or buried infiltration beds. In extreme cases, a constant-flow treatment of chlorine/sodium thiosulfate can be used to treat contaminated waters. Needless to say, keeping zebra mussels out of your fish farm will eliminate unnecessary headaches and expenses.

Control Measures

Several non-chemical practices that can help control zebra mussels at your farm are:

* **FILTRATION SYSTEMS.** Filtration is probably the most effective and economical method for operations that use surface waters. Sand filter, submerged infiltration beds and in-line filters will eliminate most stages of the zebra mussel.

* **DESICCATION.** Hatchery ponds are typically drained and allowed to dry during the off season. This practice will kill all stages of zebra mussels.

* **HEAT TREATMENT.** Contaminated equipment can be steam cleaned or immersed in hot water (140°F) for 3-4 minutes to kill juvenile and adult zebra mussels.

* **BIOLOGICAL CONTROLS.** Freshwater drum, blue catfish, redear sunfish and common carp are all known to feed on indigenous clams. A polyculture arrangement using one or a combination of these species should be effective against juvenile and adult zebra mussels.

Several chemical treatments have also proven to be effective in killing zebra mussels. Those that tested positive by Ohio State University and the National Fisheries Research Center-La Crosse researchers are as follows:

* **SALT.** Common table salt at a 1% (10,000 ppm) treatment rate for 24 hours had a 100% mortality for larval and juvenile stages of the zebra mussel.

* **BENZALKONIUM CHLORIDE.** Available commercially as ROCCAL, this chemical is recommended for use on contaminated equipment at 100 ppm for 3 hours or at 250 ppm for 15 minutes. It will kill all stages of the zebra mussel.

* **ROTENONE.** This should be used to treat infected ponds. Depending on temperature, a treatment of 1-5 ppm for 24 hours will kill adult zebra mussels.

* **CHELATED COPPER.** A 2 ppm/48 hour dose of chelated copper is another treatment for eliminating adult zebra mussels from ponds. Toxicity of copper compounds does vary with the pH and alkalinity.

* **HYDRATED LIME.** Addition of calcium hydroxide to a newly drained pond at a rate of 1000-2000 lb/acre will kill larval and juvenile zebra mussels.

No chemical treatment has proven 100% effective against all stages of the zebra mussel without harming other aquatic life forms. **Be sure to contact your state environmental agency as well as your local EPA or FDA office to determine the latest regulations before using any chemical treatment.** Should you decide on a chemical treatment, conduct a simple on-site bioassay to protect the environment and your investment. For information on a particular compound, contact the Technical Information Officer, National Fisheries Research-La Cross, WI at 608/781-6200.

by *Dr. Rick Kastner, Coastal Research and Extension Center*

Edited by:

Martin W. Brunson, Ph.D.
Chairman,
Aquaculture Program Action Team

FOR FISH FARMERS, BOX 9690,
Mississippi State, MS 39762.