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Zebra Mussel Research Technical Notes

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Control of Zebra Mussels in Service Water

Background and purpose

Because of the possible negative effects to native biota, the options for reducing densities of zebra mussels in source waters (lakes, rivers, and streams) are limited. Thus, chemical treatment is precluded. However, there are nonchemical methods for mussel control. Although these methods cannot be used in a pumping plant, they could be used to reduce zebra mussel densities at sites where it is not appropriate to use chemicals.

Additional information

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Water-level manipulation

Water levels can be drawn down in impoundments (i.e., reservoirs or artificial cooling water ponds) to expose resident mussel populations to air. Subsequent desiccation at high summer temperatures or freezing during winter can kill a substantial proportion of the exposed population. Because zebra mussels are usually restricted to shallow, nearshore areas above the thermocline (Mackie and others 1989), lowering water levels could expose the majority of the population and greatly reduce the density of adults and immature forms (veligers). Reducing the density of settling veligers in intake water would in turn reduce the settlement rate within raw water systems, and increase the time between application of mitigation measures. Such reservoir drawdowns have been used to control aquatic macrophytes.

Biological control agents

Biological controls can reduce numbers of zebra mussels in source waters. In Europe, zebra mussel densities are significantly impacted by diving ducks (Draulans 1987), crayfish (Piesik 1974), and fish (Budzynsha and others 1956, Daoulas and Economidis 1984). A number of fish species in North America are molluscivorous (Table 1). The largest impact on zebra mussels in North America will likely be from the common carp (*Cyprinus carpio*) and freshwater drum (*Aplodinotus grunniens*), which feed on adults, and the American shad (*Alosa sapidissima*), which consumes veligers through suspension-feeding. Muskrats also feed extensively on bivalves and can control zebra mussels,

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Table 1
Major Fish Predators of Freshwater Bivalves in North America and Possible North American Predators of Zebra Mussels

Family	Genus and Species	Common Name
Clupeidae	*Alosa sapidissima*	American shad
Cyprinidae	*Cyprinus carpio*	Common carp
Catostomidae	*Ictiobus bubalus* *Ictiobus niger* *Minytrema melanopus* *Moxostoma carinatum*	Smallmouth buffalo Black buffalo Spotted sucker River redhorse
Percichthyidae	*Roccus saxatilis*	Striped bass
Ictaluridae	*Ictalurus furcatus* *Ictalurus punctatus*	Blue catfish Channel catfish
Centrarchidae	*Lepomis gulosus* *Lepomis macrochirus* *Lepomis microlophus*	Warmouth Bluegill Red ear sunfish
Sciaenidae	*Aplodinotus grunniens*	Freshwater drum
Acipenseridae	*Acipenser fulvesens*	Lake sturgeon

particularly in small bodies of water (McMahon 1990). Molluscivorous fish can be stocked in some areas to aid in zebra mussel control.

It has been suggested that disease- or parasite-based zebra mussel controls could be developed. Presumably, targeted disease vectors could be used to eradicate endemic mussel populations without affecting native biota. Perhaps toxins produced by bacteria could be used as species-specific molluscicides against zebra mussels (Mitchell 1993). Indeed, a variety of lethal disease and parasitic organisms exist in marine commercial bivalve species. However, it is unlikely that biological methods will ever be used to control zebra mussels.

The advantages of using biological controls to reduce zebra mussels in source waters include reduced chemical loads required to control fouling in raw water systems that draw from an infested source, and a high level of cost-effectiveness if biological controls reduce mussel densities.

The disadvantages of biological controls are numerous. Predators are unlikely to completely eradicate mussels from source-water habitats, making raw water facilities still susceptible to fouling. Predators will not control mussel settlement and growth within raw water systems. Stocking mussel predators in isolated source-water habitats could result in the introduction of other nonindigenous species and alter the dynamic interaction of species that comprise aquatic communities. In addition, much time could be required for predators or disease organisms to control or reduce densities. Introduced predators could negatively impact indigenous sport or commercial fish species.

Concern over introducing predator species

Consideration should not be given to introducing other exotic species to control zebra mussels in North America. Aside from the difficulty of accomplishing this task, it is likely that these species could negatively affect native biota and their habitat.

It is not wise to consider moving large numbers of native species (for example, the freshwater drum) into a source water with high densities of zebra mussels.

A large number of a single species could deplete food stocks and ultimately create conditions more amenable to infestation by exotics. A useful approach would be to improve habitat conditions for the desired predator so that its populations will increase at a gradual rate and will be sustained through periods of reduced food.

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