ZEBRA MUSSELS

by

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What are Zebra Mussels you ask?...just a harmless barnacle. No, on the contrary they have become not only a nuisance but a potentially multibillion dollar threat to industrial, agricultural, and municipal water supplies. Zebra Mussels infestations have cost power plants, industrial facilities and municipalities nearly $70 million between 1989 and 1996 according to the New York Sea Grant and the National Zebra Mussel Information Clearinghouse. The U.S. Fish and Wildlife Service has estimated that over 5 billion dollars will be lost over the next ten years to manufacturing and municipal water intake facilities utilizing just the Great Lakes.

Zebra Mussels are freshwater mollusks the size of a fingernail and have a cream colored shell with dark brown bands. The shells zebra-like pattern led to the mollusks name. They firmly attach themselves to solid underwater surfaces, the only such freshwater mollusks to do so. Zebra mussels feed on floating plants and plankton by filtering water through their body. They quickly develop into colonies of hundreds of thousands per square meter clogging water intake pipes. High flow rates around water intakes make ideal locations for the mussels to feed. The cluster colonies can completely cover any submerged object quickly. Many divers upon a return engagement to a sunken shipwreck a year later have found the vessel completely covered with mussels and unrecognizable

These mollusks whose technical name is *Dressiness Polymorpha* have spread rapidly since being accidentally introduced to North America. Researchers believe that in 1986 a ship dumping ballast water first deposited the mussels in the Great Lakes. Cargo ships normally take in ballast to redistribute weight when cargo is unloaded. This ballast water then is expelled when another cargo is loaded in another port. Anything present in the ballast is then deposited in the water.

By 1991, zebra mussels had spread to virtually all the Great Lakes and presently they have been found in several dozen lakes in the surrounding states most frequently in Wisconsin and Michigan. Lakes in Ohio, Illinois and Indiana have infestations. The zebra mussel population has risen dramatically in the upper Mississippi River and have now found their way into the Tennessee River.

The life span of the Zebra Mussel is between three and six years. They generally grow to less than an inch but can develop up to two inches long. The mussels have a high reproduction rate and a mature female can produce 40,000 eggs in one season. Microscopic larvae called *veligers* hatch from the fertilized eggs within a few days in waters with temperatures exceeding 13° C (55° F). The free swimming *veligers* are carried by water currents which allows for the rapid dispersment and is the most effective distribution of the organism. The *veligers* float in the water approximately 8 to 14 days before they must attach themselves to a solid object or die. Threadlike filaments are produced by the *veligers* and used to attach firmly to surfaces. Once attached to a surface they develop a double-shell within three weeks. The zebra mussels mature and are able to reproduce within a year. The mature zebra mussel can survive in waters with temperatures between 4° C (39° F) and 30° C (81° F) and with salinity levels below 8 parts per

thousand. Due to the survivability, zebra mussels can exist in virtually all parts of the United States.

There are many methods zebra mussels use to transport to other bodies of waters. The small microscopic *veligers* can be transported by diving gear, fishing gear, bait containers and in bilges of boats, essentially anywhere water can be trapped. Adult mussels attached to the hulls of boats and can survive up to five days outside of water, plenty of time to travel to new bodies of water. In many areas boaters are advised to clean boat hulls and other water trapping compartments before moving into other waters.

Zebra mussels have few natural predators, primarily fish such as drum and carp. These predators are not nearly numerous enough to have a significant impact on a large population. The mussels ability to quickly populate a body of water and the limited number of natural predators raises concerns. Vast numbers of zebra mussels uncontrolled could alter the ecosystems food chain adversely effecting native species. One Zebra Mussel can filter approximately one liter of water per day. Many experts believe that water clarity is increased in areas where dense colonies reside. In some of the heaviest infested areas in western Lake Erie water clarity has shown dramatic increase by up to 77%.

In the Great Lakes region were zebra mussels infestations have had there greatest impact, 655 billion gallons per day of water is withdrawn for used by over 25 million people, thousands of livestock and hundreds of industries. Several water systems and industries in the Great Lakes region have already begun treatment and dozens more are making plans for controlling zebra mussels. In 1996, Cincinnati imposed a 4% rate hike to cover anticipated cost for controlling zebra mussel infestation. Divers inspecting the utilities two intakes on the Ohio River found heavy infestation. Zebra mussels were found in an impoundment of the Huron River used as the source of water for the city of Ann Arbor. The city was forced to budget $100,000 to run a pipeline to the intake an add a polymer to the inflow pipe for controlling the mussels. Industries have also been hard hit. A new fish hatchery on Lake Champlain may have to spend $4 million just to prevent the microscopic *veligers* from entering the hatchery intakes and harming the delicate salmon and trout production. A feasibility study has recommended a multistage ozone treatment system as the most cost effective way of protecting the hatchery from invasion.

The challenge is to find a cost effective way of eliminating the zebra mussels without harming native species. Adult mussels are very tolerant to many chemicals. Some methods of zebra mussel control has proven effective including chlorination, chemical treatment and heat. Ammonia, bromides, potassium permanganate, chlorine dioxide, and polymers have proven successful in controlling zebra mussels in varying degrees. Processes such as ozonation, ultraviolet radiation, electrical shock and sonic vibrations are still experimental. Because zebra mussels cannot survive in temperatures over 38° C (100° F), heat is an effective control method. Heat application, however is not generally feasible for most applications. Increased velocity in pipes hinder zebra mussel attachment. It appears that without controlling their reproductive life cycle complete body of water control appears to be improbable. Removal of the thick shells from infested areas after the mussels have died is very difficult and obviously costly.

Anyone interested in receiving information and copies of the newsletter *Zebra Mussel Update* can contact: Ohio Sea Grant College Program, (614) 292-8949, FAX (614) 292-4364. Information about new zebra mussel sightings is now available on the world wide web at

http://www.nfrcg.gov operated by the National Biological Service (NBS) Southeastern Biolobical Center in Gainsville, Fla. The web server offers real-time, spacial and logical queries of data sets on zebra mussel sightings maintained by NBS personnel.