

Exotic Mussels, Clams, and Snails: An Overview of Impacts on Lakes

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An exotic species is a non-native species that does not originate from a particular location. When international commerce and travel became prevalent, many of these species were transported to areas of the world where they did not originate. The larval forms of many organisms such as insects, plants, and shelled organisms (such as bivalves and univalves) may escape detection and be unknowingly transferred to unintended habitats. An essential ingredient to successful prevention of the unwanted transfer of exotic species to our inland lakes is awareness and education. The following summary introduces four major shelled nuisances that have been introduced into our inland lakes and have caused negative impacts to the ecosystems and to the surrounding Great Lakes.

Zebra Mussels (*Dreissena polymorpha*; Figure 1) are bivalves that were first discovered in Lake St. Clair in 1988 (Herbert et al. 1989) and likely arrived in ballast water or on shipping vessels from Europe (McMahon 1996). They are easily transferred to other lakes because they go through a larval (nearly microscopic) stage where they can easily avoid detection. The mussels then grow into the adult (shelled) form and attach to substrates (i.e. boats, rafts, docks, pipes, aquatic plants, and lake bottom sediments) with the use of byssal threads. The fecundity (reproductive rate) of female Zebra Mussels is high, with as many as 40,000 eggs laid per reproductive cycle and up to 1,000,000 in a single spawning season (Mackie and Schlosser 1996). Although the mussels only live 2-3 years, they are capable of great harm to aquatic environments. In particular, they have shown selective grazing capabilities by

feeding on the preferred zooplankton food source (green algae) and expulsion of the non-preferred blue green algae (cyanobacteria). Additionally, they may decrease the abundance of beneficial diatoms in aquatic ecosystems (Holland 1993). Such declines in favorable algae can decrease zooplankton populations and ultimately the biomass of planktivorous fish populations. Zebra Mussels are viewed by some as beneficial to lakes due to their filtration capabilities and subsequent contributions to increased water clarity. However, such water clarity may allow other photosynthetic aquatic plants to grow to nuisance levels (Skubinna et al. 1995).

Quagga Mussels (*Dreissena rostriformis bugensis*; Figure 2) are invasive bivalves that were introduced to North America in the early 1990's from the Dnieper River of Ukraine (U.S. Army Corps of Engineers, Engineer Research and Development Center). They closely resemble Zebra Mussels but are larger in size and also have a pale color near their hinge areas. Some of the biotypes present in the Great Lakes basin appear entirely white in color. A recent discovery of predation by Yellow Perch (*Perca flavescens*) on both the Quagga and Zebra Mussels has raised concerns of their apparent mortality which may be attributed to the ingestion of *Clostridium botulinum* bacteria spores that contain potent biotoxins (Yule et al., 2006). This process may indicate the negative implications of just one invasive species on the food chain of key lake biota such as fish.

The Asian Clam (*Corbicula fluminea*; Figure 3 page 17) is native to southern and eastern Asia, Australia, and Africa, but was first noted in North America

in the 1920's (Counts 1986). The bivalve is usually less than 3 cm in size, colonizes lake sediments, and feeds on organic matter. It has the ability to cross and self-fertilize which creates a high reproduction rate and colonization density of greater than 1000 m² (McMahon and Williams 1986) under some environmental conditions. Fortunately, the adult clams may only live for up to three years and are not likely to persist long if water quality conditions are less than ideal (i.e., low dissolved oxygen levels). Reproduction generally occurs when the water temperature is around 15°C (59°F), with more than one annual brood in the late spring and fall. Like Zebra Mussels, the Asian Clam, may also result in blue-green algae blooms

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Figure 1. Photo courtesy of Michigan Sea Grant



Figure 2. A Quagga Mussel, photo courtesy of U.S. Geological Survey

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because they compete with native clams for food by filtering favorable green algae from the water (along with the benthic organic matter) and this results in a disproportionate quantity of blue-green algae in the water column relative to green algae which results in a "bloom". Such declines in favorable algae can decrease zooplankton populations and ultimately the biomass of planktivorous fish populations

The exotic Banded Mystery Snail (*Viviparus georgianus*; Figure 4) is a univalve which means that only one valve is present and the shell is not hinged. The snails are actually native to the southeastern United States and periodically appear in inland lakes in Michigan, often in great numbers. In the spring these snails give birth to fully developed snails, however; it is the adults that die off due to a rapid warming of the lake. The shells then wash ashore and rot, creating an unpleasant odor. The snails do not feed much on the aquatic vegetation or phytoplankton in a lake, but rather on the organic matter at the lake bottom. The snails blend in easily with other native snails and thus are often mistaken as a natural component of the lake biota.

Although many of exotic, invasive species discussed above already exist in many inland lakes, there are preventive measures that riparians can take to reduce the probability of new introductions. The recommended prevention protocols for introduction of all invasive clams and mussels includes steam-washing all boats, boat trailers, jet-skis, and floaters prior to placing them into any lake. Boat transom wells must always be steam-washed and emptied prior to entry into a lake because larval forms of the mussels and clams can reside in transom wells and remain undetected. Excessive waterfowl should also be discouraged from the lake since they are a natural transportation vector of the microscopic clam or mussel larvae or mature adults. Fishing poles, lures, and other equipment used in other lakes (and especially the Great Lakes) should also be thoroughly washed before use in each lake.

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Figure 3. An Asian Clam, photo courtesy of U.S. Geological survey



Figure 4. The Banded Mystery Snail, photo by Lakeshore Environmental, Inc.