



# Zebra mussel

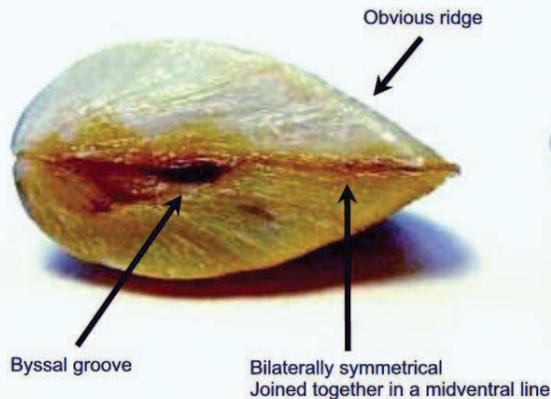
*Dreissena polymorpha* (Pallas, 1771)



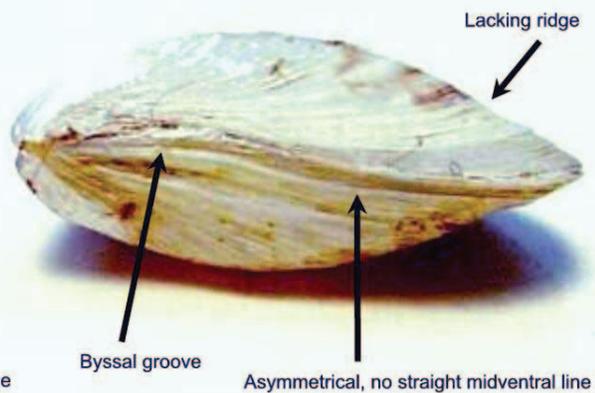
# Quagga mussel

*Dreissena bugensis* (Andrusov, 1897) syn. *Dreissena rostriformis bugensis*

*Dreissena polymorpha*



*Dreissena rostriformis bugensis*



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## Overview:

Zebra and quagga mussels are bivalve molluscs. Zebra are native to the Black, Caspian and Aral seas, and quagga to the estuarine regions of rivers in the Ukraine. These mussels expanded their range westward with the construction of interbasin canals along large European rivers during the mid-1900s.<sup>4</sup> Both species were introduced to the Great Lakes likely via ballast water discharge in the late 1980's.

Zebra and quagga mussels have separate sexes and eggs are expelled by females to be fertilized outside of the body by males, usually in the spring or summer. The microscopic larvae, called veligers, emerge within 3-5 days and are free swimming for up to a month, being dispersed by water flow.<sup>2</sup> After this time the veligers search for an attachment site, and metamorphosis and secretion of the adult shell begins.<sup>4</sup> The mussels may reach maturity in the first year, but the

second year is more usual.<sup>1</sup> A fully mature female mussel is capable of producing up to one million eggs per season.<sup>3</sup>

These non-native mussels are filter feeders and each mature adult is capable of filtering at least one litre of water per day, removing plankton, algae, and even their own veligers. Any undesirable matter is ejected as pseudofeces.<sup>1</sup> Filtering by these mussels increases water transparency and light penetration, decreased organic matter, and increased concentrations of ammonia, nitrates, and phosphates. Only certain algal species are consumed - cyanobacteria are not - leading to toxic algal blooms<sup>4</sup> which deplete the oxygen in the water, killing fish and plants.

*Dreissenids* are the only freshwater bivalves that attach themselves to hard substrates. Reproduction is prolific and once introduced to a new water body populations can reach a total biomass at least 10 times that of all other invertebrates.<sup>2</sup> They attach themselves to

hard surfaces by byssal threads, which are secreted from a byssal gland.<sup>1</sup> They will attach to rocks, wood, some plants, and man-made materials such as concrete, metal, nylon, and fiberglass. All native mussels are free living and do not attach to anything.

Zebra and quagga mussels cause major economic and ecological problems. By removing huge amounts of phytoplankton, they deplete this food source for other organisms. Accumulation of decomposing pseudofeces consumes oxygen and toxic by-products are produced. Changes in water clarity and light penetration alter entire ecosystems. *Dreissenids* accumulate high levels of organic pollutants which end up in their pseudofeces. Mussel colonies can block water intake structures of water treatment plants and hydroelectric stations, aquaculture facilities, foul docks, breakwalls, buoys, boats and beaches.<sup>6</sup> The broken shells of dead mussel colonies wash up on beaches and are sharp

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as razors, the wounds often subjected to a wide range of infections.<sup>4</sup>

## Habitat:

Zebra and quagga mussels will colonize surface standing or running waters, inland water bodies, estuaries, and brackish coastal estuaries.<sup>1</sup> The salinity, pH and temperatures of Alberta's lakes are well within the range of tolerance and optimal growth for both mussels. Water velocities exceeding two metres per second inhibit attachment.<sup>1</sup>

## Identification:

Zebra mussel shells are triangular or triagonal with a sharply pointed shell hinge end. Shell size rarely exceeds 4 cm but 5 cm is possible. There is a prominent light and dark banding pattern on the shell, which may be either smooth or zigzag in shape.<sup>1</sup>

Quagga mussel shells are shaped like the letter "D" and usually under 5 cm in length. In new populations the mussels can be very small. The outer shell commonly has alternating light and dark brown stripes, but can also be solid light brown or dark brown.<sup>3</sup>

All native mussels are free living and do not attach to anything.

## Prevention:

Prevention is so important for zebra and quagga mussels because once they establish in a natural body of water there is very little chance of eradicating them. Learn to recognize the physical characteristics of zebra/quagga mussels and know whether a body of water you enter is infested. The larval veligers can survive several days out of water in a moist environment like ropes, flotation vests, bilges, wet clothing, etc.

- properly cleaning ALL items that have come into contact with the water by;



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- soaked or scrubbed for at least one minute in a 2% bleach solution (20 ml of bleach per litre of water)
- absorbent items like felt soled waders should be soaked in hot water for more than 40 minutes.
- frozen to kill off any invasive species.

- before leaving the dock drain all the water from your boat and equipment; trailer, coolers, live wells, bilge, or buckets.

- leave equipment to dry for at least 48 hours before entering another body of water.

- wear non-felt soled waders.

- never release plants, fish or animals into a body of water unless they came out of that body of water.

- dispose unused bait by returning to its original container and put it in a garbage container.

## Control:

**Physical:** Decreasing water levels to cause desiccation of *Dreissena* spp. is effective and an environmentally neutral method in structures designed to be periodically dewatered for maintenance. Other physical methods include manual scraping, high pressure jetting, antifouling coatings, and mechanical filtration.<sup>3</sup> **Heated water treatments are a common method of decontaminating boats - a spray temperature of 60°C for 5 seconds is recommended.**<sup>4</sup>

**Chemical:** Five products are registered for use on zebra mussels and one product for both zebra and quagga mussels. Always check product labels to ensure the pesticide is registered for use on the target species in Canada by the Pest Management Regulatory Agency. Purchase and use of pesticides in water bodies requires special applicator certification and permits.

**Biological:** Research has been done to test the effectiveness of bacteria which produces a toxin that destroys the digestive system of *Dreissena* species.<sup>3</sup> Large bodied molluscivores such as carp can limit *Dreissena* populations<sup>2</sup>, but can result in negative consequences from carp predation on native fishes.

## REFERENCES

- 1 *Dreissena polymorpha*. (mollusc) Global Invasive Species Database. <http://www.issg.org>. Accessed March 9, 2014.
- 2 *Dreissena polymorpha*. Invasive Species Compendium. CABI. <http://cabi.org> Accessed March 9, 2014.
- 3 *Dreissena bugensis* (mollusc). Global Invasive Species Database. <http://www.issg.org>. Accessed March 9, 2014.
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- 5 Help Prevent the Spread of Invasive Alien Species. <http://esrd.alberta.ca/recreation-public-use/invasive-species/invasive-species-prevention.aspx>. Accessed March 9, 2014.
- 6 *Dreissena* Species FAQs. USGS Southeast Ecological Science Center. <http://fl.biology.usgs.gov>. Accessed March 9, 2014.