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Invader invaded: population dynamics of zebra mussels (*Dreissena polymorpha*) and quagga mussels (*Dreissena rostriformis bugensis*) in polymictic Oneida Lake, NY, USA (1992–2013)

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Abstract

Invasive zebra (ZM) and quagga (QM) mussels continue to spread within and across inland waters worldwide. Oneida Lake, NY, USA, is a large (207 km²), mesotrophic, polymictic lake surveyed annually for dreissenids across substrates since 1992. We estimated abundance and distribution of ZMs and QMs across substrates, calculated lakewide density and biomass, analyzed seasonal and annual differences in veliger density, and explored dynamics of species replacement. ZMs and QMs were detected in 1991 and 2005, respectively. ZM density peaked at almost 30,000 ind/m² in 1992, declined to between 2600 and 7600 ind/m² until 2008, and further declined to 370–560 ind/m² in 2010–2013 concurrent with increasing QM abundance. ZM biomass remained stable from 1992 to 2008 (140–530 g shell-on dry wt/m²) but declined to < 10 g from 2010 to 2013. QMs increased from 38% of the total biomass in 2008 to ≥ 90% from 2010 to 2013 which was accompanied by a

decrease in ZM lengths and increase in QM lengths. In shallow (< 9 m) waters, both mussels were more abundant on rock than sand and silt substrate. Only QMs were abundant in deep silt substrate. The shift from ZM to QM dominance increased total biomass, but not density, due to larger QMs. Veliger densities were higher in May and August–November after arrival of QMs; however, there was no correlation between number of veligers and new recruits in fall or adult mussel biomass. The replacement of ZM occurred over about 4 years even though published mechanisms for QM dominance are not operating in summer in Oneida Lake.

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Ethics declarations

Conflict of interest

The authors declare that they have no conflict of interest.

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