Invasive zebra mussel, *Dreissena polymorpha*, as an efficient diluent of *Diplostomum* cercariae (Digenea)

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The zebra mussel (*Dreissena polymorpha*) is an invasive bivalve native to the Ponto-Caspian region that has established introduced populations throughout Europe and North America over the past 200 years. Its high colonization, reproduction and filtration capabilities, combined with the rapid formation of dense population colonies make *Dreissena polymorpha* one of the most successful invaders affecting the structure and function of freshwater ecosystems with serious ecological, environmental, and economic consequences. In contrast to these negative impacts, however, zebra mussels can also be beneficial to native biota by diluting parasites whose larval stages occur in large numbers in the environment, such as trematode cercariae released from their first molluscan intermediate host. While many organisms, including bivalves, have been shown to reduce parasite density and thus transmission and disease risk in the next hosts in their life cycle, the dilution effect of zebra mussels on trematode cercariae still seems to be overlooked.

The aim of this study was to investigate the non-host *D. polymorpha* (i.e., a dead-end host for the parasite) as an efficient diluent of trematode cercariae of *Diplostomum mergi* emerging from their snail hosts, *Radix* spp. (Lymnaeidae). Eye flukes of the genus *Diplostomum* are widespread pathogens of the second intermediate fish host, causing eye cataracts, impaired vision and fish mortality due to decreased food intake and increased susceptibility to predation. Therefore, it is imperative to understand the potential impact of non-host-pathogen associations on disease dynamics in nature.

All model organisms were sampled in July 2022 in the artificial lakes Most and Medard in northern Bohemia (Czech Republic). The ability of zebra mussels to dilute *D. mergi* cercariae was tested in the laboratory using mussel individuals of similar size under controlled light conditions at two temperatures (18°C and 22°C) reflecting the average water temperature of colder (spring and autumn) and warmer months (summer). At each temperature, 20 mussels were allowed to filter 115 cercariae freshly emerged from naturally infected snails for 30 minutes. Despite the relatively high variability among mussel individuals, the presence of *D. polymorpha* significantly decreased the density of *D. mergi* cercariae by nearly half at each temperature. Moreover, the number of cercariae diluted by mussels was significantly higher at 22°C (47%) than at 18°C (40%), suggesting a seasonal/temperature-dependent removal rate of the parasites.

Our results provide additional evidence that bivalves may play an important ecological role in trematode population dynamics by efficiently diluting their free-living stages, thus limiting their transmission success. Because parasites are recognized as essential components of food webs that affect ecosystem structure and functioning, our results highlight the need for further research to examine intimate non-host-parasite interactions in detail, which will improve our understanding of ecosystem processes when both non-host and pathogen are considered.

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