IMPLICATIONS OF BIODEPOSITION BY FRESHWATER MUSSELS FOR LAKE RESILIENCE

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Freshwater mussels are often a target of restoration activities in lakes because of their ability to increase ecosystem resilience through water filtration and the poorly-understood process of biodeposition that can translocate nutrients and suspended particulates into the sediments. To improve knowledge of mussel-sediment interactions, we (i) quantified biodeposition rates of the New Zealand mussel Echyridella menziesii in six North Island lakes covering a range of productivity, and (ii) conducted laboratory feeding experiments over seven days to determine the effect of food type (concentrated commercial phytoplankton, fine suspended sediment in the form of kaolin, microcystin-producing Microcystis) on biodeposit production. Field biodeposition rates in the six lakes ranged from 1.54 (Lake Karapiro) to 12.89 (Taupo) mg dry weight·g^{-1} mussel dry weight·h^{-1}, with the highest rate reflecting abundant sand grains and small rocks (mean excluding this outlier = 3.0 mg·g^{-1}·h^{-1}). Mean biodeposition rates by Karapiro mussels fed in the laboratory (mean 0.50 mg·g^{-1}·h^{-1}) were lower than that recorded in the field. Laboratory biodeposition rates were higher for mussels in natural lake-bed substrates than those in clean sand, indicating that around one-third of ejected biodeposits may be derived from benthic substrates. Addition of kaolin clay to achieve a suspended sediment concentration of 30 mg·L^{-1} increased total and inorganic biodeposit production rates by 24-33% compared to mussels fed concentrated phytoplankton, but rates were not significantly affected when fed Microcystis algae. Addition of kaolin to the diet resulted in visible accumulations of white biodeposits on substrate surfaces confirming the potential for incorporation of suspended sediment into lake-bed sediments. These data indicate that biodeposition from dense mussel beds has the potential to transfer significant amounts of suspended particulates and toxic algae from the water column to lake-bed sediments, with implications for benthic-pelagic coupling and lake resilience.