Biomixing in stagnant water above population of blue mussels (Mytilus edulis).

Dense beds of filter-feeding mussels can exert a considerable grazing impact on phytoplankton in many marine areas depending on downmixing promoted by current, wave- and wind action. But downmixing may also be promoted by biomixing caused by the action of the strong exhalent jets of water from the mussels. Here we study the strength of biomixing exerted by large actively filtering blue mussels Mytilus edulis in stagnant water. Vertical concentration profiles of added algal cells (Rhodomonas salina) were measured (as chl a) over a 70 cm high and stagnant water column in an aquarium above a population of 48 ind.m⁻² of mussels of shell length 69.5 ± 2.3 mm. Due to the intense agitation (biomixing) generated by exhalant jets of the actively feeding mussels the profiles remained nearly uniform over the full water column while decreasing exponentially with time, reaching a level of about 40% of the initial level after 120 min, which implied a population filtration rate of about 0.3 m³.h⁻¹.m⁻² in agreement with prior clearance measurements. Comparing to numerical solutions of a one-dimensional diffusion model, varying the eddy diffusivity, a value of D = 550 × 10⁻⁶ m².s⁻¹ was estimated. This high strength of biomixing far exceeds those of previous similar studies on the filter-feeding polychaete Nereis diversicolor (0.3 × 10⁻⁶ m².s⁻¹) and the ascidian Ciona intestinalis (150 × 10⁻⁶ m².s⁻¹) and suggests that biomixing in moderate benthic boundary layer flows past mussel beds may contribute to the downmixing of phytoplankton.

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