



Interactions between sediment resuspension and sediment quality decrease the TN:TP ratio in a shallow lake

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ABSTRACT: The relative contributions of sediment resuspension and external nutrient loading to seasonal fluctuations of the total nitrogen to total phosphorus (TN : TP) ratio in the water column of the shallow Kirkkojärvi basin were studied. In May, the TN: TP mass ratio was above 30, but it decreased to below 10 in July-August. In October, the ratio increased again. Water quality was regulated by external loading in spring, but the sharp decrease in the TN: TP ratio in July-August resulted mainly from the elevated sediment resuspension rate. In May and October, the resuspension rate was below 20 g dry weight (wt) m⁻² d⁻¹, while in July-August it exceeded 60 g dry wt m⁻² d⁻¹. Sediment resuspension decreases the TN: TP ratio in the water because the ratio in the surface sediment is low. The high resuspension rate in July-August could not be explained by wind effects, water level fluctuations, or bioturbation, but was instead attributed to the seasonal change in the sediment quality. During the summer, fresh material having low critical shear stress settled on the bottom until the critical shear stress was lower than the actual shear stress, and the resuspension rate increased steeply, although no increment in wave effects occurred. For a shallow lake, a single representative TN: TP ratio is misleading, because the seasonally fluctuating resuspension rate substantially affects the ratio and may induce switches between N and P limitation. Seasonal fluctuations in the resuspension rate may have important effects on algal communities, because low N to P ratios can favor N-fixing cyanobacteria over other algal groups. In Kirkkojärvi, cyanobacteria became the dominant algal group during the period of intensive resuspension.

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