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Effect of wastewater discharge on phytoplankton in southern California coastal ocean

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Abstract

Wastewater discharged from outfalls in urbanized coastal ocean areas contains high concentrations of nutrients affecting the structure and biomass of near-shore phytoplankton. The goal of this study is to detect the effect of effluent on phytoplankton biomass over major submerged outfalls in southern California and to quantify the role of these nutrients in sustaining phytoplankton growth. This assessment was based on an extensive dataset of chlorophyll fluorescence profiles, collected between 1998 and 2015 during routine water-quality monitoring around four sewer outfalls responsible for >85% of wastewater discharge in that area. Chlorophyll fluorescence was transformed to chlorophyll concentration by comparing fluorescence to discrete chlorophyll measurements in bottle samples. Daily phytoplankton nitrogen consumption was calculated using a model based on constant chlorophyll-a-to-carbon and carbon-to-nitrogen ratios and constant phytoplankton growth rate. The results demonstrate that total nitrogen discharged from major outfalls sustains phytoplankton growth within 3–5 km around each outfall (3–8% of primary production in the near-shore zone). Small but significant increase of chlorophyll concentration was detected over all four outfalls.