LETTER

Coastal eutrophication: Whether N and/or P should be abated depends on the dynamic mass balance

Whether nitrogen (N) and/or phosphorus (P) should be abated to counteract coastal eutrophication remains controversial. System-wide lake experiments presented in PNAS have shown that P control was essential for dampening algal blooms whereas N control only strengthened the competitive advantage of cyanobacteria and increased fixation of dissolved N_2 from the atmosphere (1).

We have recently found that P concentrations and fluxes in all basins of the Baltic Sea could be dynamically modeled with good results using a general set of calibration constants and that key operational bioindicators, such as chlorophyll concentration and Secchi depth, may be predicted from modeled P concentrations without taking N loadings into account. N models for this area either provide poor predictions in some basins or require basin-specific calibration, which fundamentally undermines the credibility of their predictions. Many major N fluxes are also highly variable and uncertain (2).

This issue involves high societal stakes. An abatement plan for the Baltic Sea, which will cost $4 billion per year (3), was signed by all Baltic Sea countries in 2007. According to calculations by the Swedish Department of Agriculture, N reductions in the plan cannot be fulfilled unless a large part of Swedish agriculture would be permanently shut down (4). However, upgrading urban sewage treatment of P in the catchment could decrease the trophic state of the Baltic Sea to levels of the years 1900–1920 (2). Conversely, N abatement is a very expensive shot in the dark that may favor cyanobacteria instead of the water quality.

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