Phytoplankton response to climate warming modified by trophic state

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ABSTRACT: We investigated the combined effect of reduced phosphorus supply and warmer winter and spring conditions on the diatom spring bloom of a shallow lake. Simulations with a simple dynamic model indicated that reduced ice cover and increasing water temperatures resulted in a more intense and earlier bloom independently of phosphorous concentrations. However, whereas the collapse of the bloom was caused by silicate limitation under high phosphorus supply, it was caused by *Daphnia* grazing under reduced phosphorus supply. This switch from a bottom-up to a top-down driven collapse of the diatom spring bloom explains why, despite similarly mild winters, the bloom was observed earlier under high than under reduced phosphorus supply in the lake studied. Thus, an assessment of possible changes in nutrient loading is crucial when anticipating how phytoplankton could evolve under future climate warming.

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